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THE KAHN TEST IN LEPROSY

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The view is generally accepted that the results obtained in the examination of serum by the complement fixation test of Wassermann and by the precipitation test of Kahn are very similar. Detweiler,(2) Strumia,(11) Young,(13) and Dulaney(3) have compared the results of the two tests with a range of agreement of from 82.7 to 94.2 per cent. (See Tables 1 and 2.) Keim and Wile(10) compared the results of the two tests in various types of syphilis with an agreement ranging from 45 to 75 per cent, and pointed out a sensitiveness in favor of the Kahn test (Table 3). Ide and Smith(5) in examining 2,165 sera found identical results between the two (Wassermann and Kahn) tests after eliminating the one-plus and doubtful reactions, and concluded that the value of the Kahn test is as great as that of the Wassermann test. Holmes(4) found in 1,000 patients a greater sensitivity to the Kahn test, especially in treated cases. Kahn in 2,060 examinations found an agreement of 97.04 per cent.(6)

Opinion has been and still is unsettled on the reaction of the serum of leper patients when tested by the complement fixation test. The consensus among leprologists and others in the recent past was that the serum of leper patients yielded in various degrees a positive reaction to the old Wassermann test, and by using various antigens. A valuable review of the literature on this point was made by Kolmer and Denney.(8)

Bloomberg(1) in 1911 for the first time called attention to the possibility that the positive Wassermann reaction in leprosy may be due to the concomitant presence of either syphilis or yaws, or both. Kolmer and Denney (8) performed the old Wassermann test by using cholesterinized alcoholic extract of beef heart, plain alcoholic extract of beef heart, and acetone insoluble lipoids as antigens. They also used the new modification of the Wassermann test by Kolmer, according to a standardized technic.(7) The tests were performed on one hundred fifty-nine cases of leprosy, comprising thirty-nine nodular cases, thirty-two anæsthetic cases, and eighty-eight mixed cases. With the new complement fixation test (Kolmer), twenty-seven cases, or 17 per cent, yielded positive reactions, but all of these showed evidences of syphilis. With the old complement-fixation test, the serum of thirty-six cases, or 22 per cent, yielded positive reactions. Twenty-seven of these showed evidences of the presence of syphilis, leaving nine cases, or 5.7 per cent, in which evidences of syphilis could not be found; but the sera yielded a positive reaction, especially with cholesterinized acetone insoluble lipoids as antigens.

Yagle and Kolmer (12) examined twenty-eight leper sera. Twenty-three of these showed no evidences of syphilis, the Kahn reaction was negative in all except two, and the new complement fixation (Kolmer) was negative in all. Two cases of leprosy with suspicious lesions of syphilis gave Kahn plus-minus (±), and the new complement fixation (Kolmer), negative. Their conclusion was that the Kahn precipitation test is uniformly negative in sera of nonsyphilitic lepers.

The positive reactions in the complement fixation test and in the precipitation test are said to be due to the presence in the serum of a so-called "reagin," or "antibody," or a "lipotropic substance."

The experiments reported in this paper were made in order to determine whether or not any of the foregoing substances is present in the serum of leper patients. They were submitted to the Wassermann test, according to the technic used in the Bureau of Science of Manila,[1] and to the precipitation test of Kahn (Rappleyea technic).(9)

The antigen used was a powdered heart muscle extracted four times with ether. The powder, after the ether extraction, was

[1] The Wassermann tests were performed in the Bureau of Science by Drs. Otto Schöbl and José Ramirez.

dried. Five cubic centimeters of 95 per cent alcohol were added to every gram of the dried powder, and extraction therein was continued for three days. Six milligrams of chemically pure cholesterin were then added to every cubic centimeter of this extract.

The cholesterinized antigen was mixed with varying amounts of 0.85 per cent salt solution. Each of the mixtures was titrated with the purpose of determining the mixture which would give a soluble precipitate upon the addition of 0.15 cubic centimeter salt solution and a later addition of 0.5 cubic centimeter salt solution. The mixture giving this result was the one used in making the test.

The test was performed as follows: The antigen was mixed with the amount of salt solution as determined by the foregoing titration. Three test tubes were used, containing 0.05 cubic centimeter, 0.025 cubic centimeter, and 0.0125 cubic centimeter antigen-salt mixture, respectively. The clear serum to be tested was inactivated for thirty minutes at 56° C. To each of the three test tubes, 0.15 cubic centimeter of the inactivated serum was added, the mixture shaken for two minutes, and then incubated in a water bath at 37° C. for fifteen minutes. One-half cubic centimeter of normal salt solution was then added. The results were read immediately after adding the 0.5 cubic centimeter of the normal salt solution. The negative sera were incubated overnight, and another reading was made. In a few cases, the negative sera in the first reading showed positive precipitation after incubation overnight.

NONLEPER SERA

In order to establish a check on the technic used, one hundred sera of nonleper patients were tested, both for the Wassermann and for the Kahn tests. These sera were obtained partly from the venereal clinic and partly from the out-patient department of San Lazaro Hospital. The results are shown in Table 12. A comparison of the agreement is indicated in Table 13. "Absolute agreement" is the term used where the number of pluses with the Wassermann test corresponds exactly with the number of pluses with the Kahn test. "Partial agreement" is used where the difference in the reading between the two tests is "±" or "+." "Nonagreement" is used where the difference is "++" or more. It will be noted that partial agreement, ranging from 76.92 to 100 per cent, was observed in the one hundred sera. In negative cases, a partial agreement of 93 per

cent was obtained, and in positive cases a partial agreement of 93.10 per cent.

The results of the foregoing technic compare favorably with the results obtained by other workers (see Tables 1, 2, and 3), and it was therefore used in testing the sera from leper suspects and leper patients.

LEPER SERA

One hundred sera obtained from the leper patients and leper suspects of San Lazaro Hospital, who consented to have their blood taken, were tested for the Wassermann reaction in the Bureau of Science and for the Kahn test in the San Lazaro Hospital laboratory. These cases consisted of nineteen suspects (having suspicious clinical manifestation of leprosy, but not showing *Bacillus lepræ* under the microscope); seventy-three nodular cases; one macular; and seven mixed. There were eighty males and twenty females. The duration of the disease ranged from several months to ten years. One case was of twenty-one years' duration. There were two cases in whom the duration of the disease was unknown; but, according to the patients, they had had the lesions for many years. The ages ranged from 7 to 65 years.

ANALYSIS OF TABLE 4

Table 4 shows the comparative results of the Kahn and the Wassermann tests. For purposes of comparison, the results "—," "±," and "+" were considered under the general heading of "negative" and the results "++" or more under the general heading of "positive." Accordingly, there were ninety-three Wassermann negatives and ninety-two Kahn negatives in the one-hundred sera. Of the ninety-three Wassermann negatives, three had 2+ Kahn (Nos. 29 and 41 had negative history of syphilis while No. 84 had suspicious syphilitic history) and three cases had 3+ Kahn (Nos. 36, 75, and 96 had negative syphilitic history). Of the ninety-two Kahn negatives, three cases were Wassermann positive (Nos. 18 and 80 had suspicious history of syphilis and case 74 a positive history of yaws).

There were five Wassermann positives. Two of these had syphilitic history, two had history of yaws, and one had no history of either. There were eight Kahn positives, of whom two had history of syphilis, and one of yaws, while the remaining five had no history of either. Summarizing, we see that there was one serum that gave a positive Wassermann determination, and

there were five sera that gave positive Kahn determination, without any history or clinical symptoms of syphilis or yaws.

Two sera gave anticomplementary Wassermann test.

It must here be remarked that, in interpreting the real value of the knowledge as to whether a case has a history of syphilis, in some cases it is very difficult to obtain such a history satisfactorily. This is because syphilis is a disease which has only recently become known among the poor and ignorant class.

ANALYSIS OF TABLES 5 AND 9

Under the classification of "suspect" were included cases which clinically showed manifestations of leprosy, but which were persistently negative for the bacillus of leprosy. Of nineteen suspects, eighteen were negative and one was positive in the Kahn test (No. 98 with positive history of yaws). There were seventeen Wassermann negatives and two positives (No. 98 with positive yaws history and No. 18 with suspicious history of syphilis). Sixty-seven of seventy-three nodular cases were Kahn negative, and six were positive (Nos. 29, 41, 75, and 96 with negative history of syphilis, No. 53 with suspicious history of syphilis, and No. 84 with positive history of syphilis). There were sixty-eight Wassermann negatives and three positives (No. 74, yaws; No. 53, suspicious syphilis; No. 80, suspicious syphilis) and two anticomplementary.

One macular case was negative both to Kahn and to Wassermann.

Six of the seven mixed cases were negative to Kahn and one was positive (No. 36, with negative syphilis history). All these mixed cases were negative to Wassermann.

ANALYSIS OF TABLES 6, 7, 10, AND 11

No definite relation of the occurrence of positive Kahn or Wassermann reaction to the duration of the disease or to the sex of the patient was observed.

SUMMARY AND CONCLUSIONS

1. One hundred nonleper sera, obtained from the venereal clinic and out-patient department of San Lazaro Hospital, were examined for the Wassermann and the Kahn tests. There was an agreement in the results of 93 per cent.

2. One hundred leper and leper-suspect sera were tested by the Wassermann reaction and by the precipitation test of Kahn.

3. There was very close agreement in the results of the Wassermann and the Kahn tests with a slight sensitiveness in favor of the Kahn test.

4. The Wassermann and the Kahn tests in leper patients are generally negative.

5. There was observed, in 1 per cent of leper and leper-suspect sera, positive Wassermann reaction without any history or signs of syphilis or yaws. In confirmed leper sera, the Wassermann test was positive in 1.23 per cent of the cases without any signs or history of syphilis or yaws. Kolmer and Denney found that 7.32 per cent of nonsyphilitic leper sera gave falsely positive Wassermann reaction.

6. The Kahn test was positive in 5 per cent of leper and leper-suspect sera without any signs or history of syphilis or yaws. In confirmed-leper sera, the Kahn test was positive in 6.17 per cent of the cases without any sign or history of syphilis or yaws.

7. As far as lepers are concerned, the Kahn test is of greater value than the Wassermann test in excluding syphilis or yaws, and of less value in establishing the diagnosis of these two diseases.

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TABLE 1.—*Comparative results of complement fixation test and precipitation test of Kahn (various authors).*

Author.	Specimens.	Agreement.	Relative agreement.	Nonagreement.	Remarks.
		Per cent.	*Per cent.*	*Per cent.*	
Detweiler	2,000	94.2			Wassermann.
Strumia		90.0			Kolmer.
Young	8,070	93.754	5.353	0.892	Wassermann.
Dulaney	900	87.77		12.23	Do.
Argüelles	100	93.00		7.00	Do.

TABLE 2.—*Comparison of complement fixation and precipitation reaction in syphilis (Strumia).*

Precipitation test.	Sera tested.	Complement fixation.		Precipitation reactions.			Agreement.
		Positive.	Negative.	Positive.	Negative.	Doubtful.	
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Kahn (cholesterinized antigen)	624	41.0	59.0	49.8	48.2	2.0	83.4
Kahn (plain antigen)	566	40.0	60.0	30.4	65.5	4.0	82.7

TABLE 3.—*Comparative results of the Wassermann and the Kahn tests (Keim and Wile).*

Type.	Specimens.	Agreement.	Remarks.
		Per cent.	
Primary syphilis	350	66.6	Remaining 33.3 per cent sensitiveness, favorable to Kahn.
Secondary syphilis		53.3	Remaining 46.6 per cent sensitiveness, favorable to Kahn.
Others remaining		46.6	Sensitiveness, favorable to Kahn.
Cerebrospinal syphilis		45.0	Remaining 55 per cent sensitiveness, favorable to Kahn.
Latent syphilis		76.3	Remaining 23.7 per cent sensitiveness, markedly favorable to Kahn.
Tertiary syphilis			Sensitiveness, markedly favorable to Kahn.
Congenital			Do.

TABLE 4.—*Comparison of results of the Kahn and the Wassermann tests in lepers.*

[K = Kahn; W = Wassermann.]

Examination.	K—	K ±	K+	K++	K+++ K++++	Total.
W—	57	5		1	1	64
W±	18	2	1		1	22
W+	1	2	1	2	1	7
W++			2		1	3
W+++ W++++		1			1	2
Anticomplementary	1		1			2
Total	77	10	5	3	5	100

TABLE 5.—*Results of the Kahn test with reference to the types of leprosy.*

Type.	K—		K±		K+		K++		K+++ K++++		Total.	
		P. ct.		*P. ct.*		*P. ct.*		*P. ct.*		*P. ct.*		*P. ct.*
Suspect	16	84.2			2	10.52	0		1		19	100
Nodular	55	75.34	9	12.32	3	4.11	3	4.11	3	4.11	73	100
Macular			1						0		1	100
Mixed nodular and anæsthetic	6	85.72							1	14.28	7	100
Total	77		10		5		3		5		100	

TABLE 6.—*Results of Kahn test in relation to the duration of leprosy.*

Duration.	K—	K±	K+	K++	K+++
Years.					
Less than 1	15	3			
1	18	3			
2	15	2		1	1
3	10	1	2	1	1
4	2	1	2	1	1
5	3				
6	7				
7	3				1
8	1				
9					
10	1		1		
More than 10	1				
Unknown	1				
Total	77	10	5	3	4

TABLE 7.—*The Kahn test and the sex of lepers.*

Sex.	K—	K±	K+	K++	K+++	Total.
Male	61	9	5	2	3	80
Female	16	1		1	2	20
Total	77	10	5	3	5	100

TABLE 8.—*Material for this study according to the type of leprosy.*

Type.	Sera.
Suspect	19
Nodular	73
Macular	1
Mixed	7
Anæsthetic	0
Total	100

TABLE 9.—*Results of Wassermann test in relation to the types of leprosy.*

Type.	W—		W±		W+		W++		W+++		Anticomplementary.		Total.
		P. ct.		*P. ct.*		*P. ct.*		*P. ct.*		*P. ct.*		*P. ct.*	
Suspect	9	47.36	7	36.84	1	5.26	2	10.52					19
Nodular	50	68.49	13	17.80	5	6.84	1	1.369	2	2.73	2	2.73	73
Macular					1								1
Mixed	5	71.42	2	28.57									7
Total	64		22		7		3		2		2		100

TABLE 10.—*Results of the Wassermann test in relation to the duration of leprosy.*

Duration.	W—	W±	W+	W++	W+++	Anticomplementary.	Total.
Years.							
Less than 1	15	3			1		19
1	16	5	1	0			23
2	12	4	2	0			18
3	8	4	2	1			15
4	0	4	2	1			7
5	2	1					3
6	5	1				1	7
7	2				1		3
8	1						1
9	0						
10	1					1	2
More than 10	1						1
Unknown	1			1			2
Total	64	22	7	3	2	2	100

TABLE 11.—*The Wassermann test and the sex of lepers.*

Sex.	W—	W±	W+	W++	W+++	Total.
Male	54	15	5	3	1	79
Female	11	7	2			21
Total	65	22	7	3	1	100

TABLE 12.—*Comparative results of nonleper sera in the Wassermann and the Kahn tests.*

Examination.	W—	W±	W+	W++	W+++ W++++	Anticomplementary.	Total.
K—	30	6	9		2	5	52
K±	2	3	2				7
K+		1					1
K++	2	2		2	5	1	12
K+++		1	2	3	22		28
Total	34	13	13	5	29	6	100

TABLE 13.—*Tabulated results of agreement of the Wassermann and the Kahn tests in nonleper sera.*

	W−	W±	W++	W+++ / W++++	Total.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	
Absolute agreement	88.23	23.07	40.00	75.86	57
Partial agreement, + difference	94.11	76.92	100.00	93.10	93
Nonagreement, + + or more difference	5.89	23.08	0	6.90	7

TABLE 14.—*List of lepers and leper suspects.*

No.	Name.	Wassermann.	Kahn.	Age.	Sex.	Type.	Duration of illness.	
							Yrs.	*mos.*
1	C. M.	—	—	29	M	Nodular		3
2	D. E.	±	—	34	M	Suspect	2	
3	J. C.	±	—	44	F	do	4	
4	A. M.	±	—	18	M	do		2
5	P. G.	±	—	19	F	do	2	
6	S. M.	—	—	32	M	Mixed	1	6
7	L. T.C.	±	—	24	M	do	6	
8	J. C.	—	—	27	M	do	6	
9	T. C.	±	—	32	M	Suspect	2	6
10	P. M.	±	—	38	M	Nodular		11
11	A. N.	—	—	15	F	do	2	
12	B. E.	—	—	65	M	Suspect		2
13	M. C.	—	—	37	M	Nodular	10	
14	C. R.	—	—	18	M	do	6	
15	L. A.	±	—	66	M	do	3	
16	A. G.	±	—	32	M	Suspect	3	
17	Y. P.	±	—	21	M	Mixed		6
18	B. R.	++	+	60	M	Suspect	3	
19	A. M.	—	—	56	M	do		5
20	A. G.	—	—	57	M	do	3	
21	N. A.	—	—	59	M	Nodular	1	
22	I. R.	—	—	22	M	Suspect	1	7
23	A. P.	±	—	16	M	do	1	
24	O. P.	—	—	22	M	Nodular	1	
25	J. C.	—	—	45	M	do	2	
26	F. F.	—	—	25	F	Suspect	5	
27	A. A.	+	+	20	M	do	3	
28	J. L.	—	—	30	F	do	7	
29	G. A.	+	++	36	F	Nodular	4	
30	P. V.	—	—	35	M	do	6	
31	J. A.	+	—	17	M	do	1	
32	M. P.	—	—	38	M	Mixed	21	
33	J. F.	±	—	14	M	Nodular	4	
34	R. F.	—	—	46	M	do	5	
35	H. S.	—	—	19	M	do	1	
36	L. S.	—	+++	19	M	Mixed	2	
37	A. C.	—	±	21	M	Nodular		6
38	E. M.	—	—	41	M	do		4
39	V. M.	—	—	24	M	do	2	

TABLE 14.—*List of lepers and leper suspects*—Continued.

No.	Name.	Wassermann.	Kahn.	Age.	Sex.	Type.	Duration of illness.
							Yrs. mos.
40	J. C.	—	±	55	M	Suspect	1
41	P. S.	—	++	35	M	Nodular	3
42	P. R.	—	—	19	M	do	3
43	P. R.	—	—	22	M	do	1
44	F. F.	—	—	19	M	do	10
45	M. I.	—	—	33	M	Mixed	1
46	C. S.	—	—	37	M	Suspect	7
47	S. T.	—	—	39	M	Nodular	1 6
48	A. M.	±	—	15	M	do	1
49	F. G.	(a)	—	30	M	do	6
50	F. S.	—	—	14	M	do	6
51	M. E.	—	—	11	M	do	6
52	G. G.	—	—	35	F	do	4
53	A. M.	+++	+++	28	F	do	7
54	M. G.	—	—	30	F	do	3
55	G. C.	±	+	30	F	do	4
56	M. B.	—	—	25	F	Suspect	1
57	B. B.	—	±	23	M	Nodular	9
58	M. M.	±	—	18	F	do	1 6
59	G. V.	—	—	30	M	do	2
60	J. M.	(a)	+	22	M	do	10
61	V. R.	—	—	29	M	do	2
62	P. H.	—	—	34	M	do	11
63	M. S.	—	—	18	F	do	3
64	E. L.	—	—	18	M	do	1
65	E. C.	+	±	19	M	do	2
66	A. M.	—	±	30	M	do	1 2
67	P. F.	±	—	16	F	do	1
68	M. C.	+	±	22	F	Macular	3
69	A. S.	—	—	27	M	Nodular	8
70	F. G.	±	±	24	M	do	1
71	T. A.	—	—	50	M	do	6
72	P. A.	—	—	34	M	do	3
73	F. B.	—	—	50	M	do	11
74	F. C.	+++	±	21	M	do	3
75	A. C.	+	+++	22	M	do	4
76	J. G.	—	—	42	M	do	1
77	B. G.	—	—	15	M	do	3
78	L. G.	—	—	15	M	do	1
79	R. L.	—	—	57	M	do	2
80	F. M.	++	+	37	M	do	4
81	U. M.	—	—	42	M	do	7
82	L. R.	—	—	22	M	do	2
83	A. P.	—	—	17	M	do	2
84	B. R.	+	++	17	M	do	1 6
85	M. B.	—	—	7	M	do	3
86	C. C.	—	—	15	M	do	8
87	P. A.	—	—	50	F	do	3
88	T. L.	—	—	30	F	do	1
89	E. A.	—	—	10	F	do	(b)
90	R. I.	—	—	15	F	do	1

[a] Anticomplementary.

[b] Unknown.

TABLE 14.—*List of lepers and leper suspects*—Continued.

No.	Name.	Wassermann.	Kahn.	Age.	Sex.	Type.	Duration of illness.
							Yrs. mos.
91	C. B.	±	—	30	F	Nodular	5
92	P. C.	—	—	45	M	do	1
93	B. B.	±	—	40	F	do	1 3
94	A. B.	—	—	19	M	do	2
95	T. F.	—	±	39	M	do	1
96	F. E.	±	+++	19	F	do	3 ?
97	P. G.	±	±	57	M	do	4
98	I. J.	++	+++	65	M	Suspect	[b]
99	P. E.	—	±	20	M	Nodular	2
100	C. S.	±	—	27	M	do	1 6

[b] Unknown.

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ANALYSES OF CHINESE FOOD MATERIALS

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The available data on the chemical composition of Chinese foodstuffs published to date [1] is meager and touches only the fringe of this large field. In the case of the prepared foods, samples vary greatly in different localities. In the Occident, recent years have seen the growth of an intelligent interest in the contributions to food science which the experience of the Orient, extending over thousands of years, has to offer. Furthermore, a real need now exists for analytical data as an aid to dietary studies in China, and as a basis for more carefully regulated hospital diets. A large amount of data on Chinese foods must be accumulated that these needs may be met more adequately.

The laboratory of chemistry of Shantung Christian University has during the last few years carried out a large number of chemical analyses of Chinese foodstuffs, for use in dietary and nutrition studies. A few of these analyses have been published.[2] Data on some additional food materials are presented in this paper as Tables 1 and 2.

The analyses here given [3] are all for materials purchased on the streets of Tsinanfu, the capital of Shantung Province,

[1] Among the most important contributions on the analysis of Chinese food materials should be mentioned the following: W. C. Blasdale, Bull. U. S. Dept. Agr. Exp. Sta. No. 68 (1899); K. Blunt and C. C. Wang, Journ. Biol. Chem. 28 (1916) 125; B. E. Read, Journ. Am. Chem. Soc. 40 (1918) 817; C. O. Levine and W. W. Cadbury, China Med. Journ. 32 (1918) 536; H. Embrey and T. C. Wang, China Med. Journ. 35 (1921) 247; C. C. Wang, Journ. Biol. Chem. 49 (1921) 429.

[2] W. H. Adolph and P. C. Kiang, China Med. Journ. 34 (1920) 268; W. H. Adolph and C. M. Wu, National Med. Journ. (China) 6 (1920) 231; W. H. Adolph, Journ. Home Econ. 14 (1922) 63.

[3] The author is indebted to some of his students for assistance in carrying out the routine determinations. Thanks are due to Prof. A. P. Jacot of Shantung Christian University for establishing the botanical identity of a number of the vegetable foodstuffs.

Where necessary, the analysis is given both in terms of the edible portion (E. P.), and of the material as purchased (A. P.). The standard methods of the Association of Official Agricultural Chemists (1920 edition) were followed in making the analyses. The Soxhlet apparatus was used in the determination of the fats. All analyses were performed in duplicate. In calculating the fuel value, 1 gram of protein was reckoned as yielding 4 calories; 1 gram of fat, 8.9 calories; and 1 gram of carbohydrate, 4 calories.

TABLE 1.—*Analyses of Chinese food materials (animal food).*

[A.P. = as purchased; E.P. = edible portion.]

Analysis. No.	Food materials.		Refuse.	Water.	Protein.		Fat.	Total carbohydrates.	Ash.	Fuel value (calculated).	
	Chinese names (Peking romanized).	English name.			N × 6.25.	By difference.				Per pound.	Per 100 grams.
		Shellfish, etc.:	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Calories.*	*Calories.*
45	Hai-shen	Sea slugs, A. P.		4.99	44.22		0.92	8.09	41.78	976	217
86	Hai-mi	Dried shrimps, A. P.		25.72	46.33		1.97	0.86	25.12	922	205
		Eggs:									
44	Chi-tan	Hens' eggs (whole egg), E. P.		70.98	13.30	14.67	12.82		1.53	779	173
44	do	Hens' eggs (whole egg), A. P.	14.26	60.86	11.40	12.58	10.99		1.31	666	148
42	Chi-tan-huang	Hens' eggs: yolk		51.92	15.49	16.82	28.85		2.41	1,460	324
43	Chi-tan-pai	Hens' eggs: white		86.17	11.55	12.99	0.02		0.82	234	52
41	Pien-tan	Preserved eggs (whole egg), E. P.		67.26	15.29	17.57	12.45		2.72	814	181
41	do	Preserved eggs (whole egg), A. P.	13.33	58.29	13.25	15.23	10.79		2.36	706	157
39	Pien-tan-huang	Preserved eggs: yolk		63.13	14.22	16.61	17.86		2.40	1,012	225
40	Pien-tan-pai	Preserved eggs: white		76.76	17.75	19.77	0.01		3.46	356	79

TABLE 2.—*Analyses of Chinese food materials (vegetable food).*

[A. P. = as purchased; E. P. = edible portion.]

Analysis No.	Food materials.			Refuse.	Water.	Protein N × 6.25.	Fat.	Nitrogen-free extract (carbohydrates).	Fiber.	Ash.	Fuel value (calculated).	
	Chinese name (Peking romanized).	English name.	Botanical name.								Per pound.	Per 100 grams.
		Cereals and cereal preparations:		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Calories*	*Calories*
53	Hsiao-mai	Wheat, A. P	*Triticum vulgare*		7.77	11.55	1.81	74.96	1.10	2.81	1,629	362
65	Ta-mi (Tao)	Rice, A. P	*Oryza sativa*		10.05	9.60	0.19	79.63	0.24	0.29	1,616	359
66	No-mi	Glutinous rice, A. P	*Oryza glutinosa*		11.52	5.84	0.21	81.93	0.36	0.14	1,584	352
47	Hsiao-mi (Su)	Spiked millet, A. P	*Setaria italica*		9.48	9.67	4.18	74.03	0.85	1.79	1,674	372
48	Huang-mi (Chi)	Panicled millet (glutinous), A. P	*Panicum miliaceum*		8.49	10.88	3.36	74.63	1.02	1.62	1,674	372
49	Kao-liang (Shu-shu)	Barbadoes millet (kaoliang), red variety, A. P	*Sorghum vulgare*		12.05	8.01	4.18	72.61	1.82	1.33	1,620	360
51	do	Barbadoes millet (kaoliang), yellow variety, A. P	do		5.58	9.71	4.12	78.04	1.44	1.11	1,742	387
52	do	Barbadoes millet (kaoliang), white variety, A. P	do		3.68	9.32	4.95	80.11	0.39	1.55	1,809	402
67	Ts'an-tzu	Finger millet, A. P	*Eleusine coracana*		8.50	5.84	5.75	74.26	2.01	3.64	1,679	373
36	Yü-shu-shu	Corn (maize), A. P	*Zea mays*		8.99	8.56	4.40	74.92	1.28	1.85	1,679	373
35	Mien-t'iao	Noodles (wheat flour), A. P			33.22	8.05	0.65	56.34	0.35	1.39	1,188	264
34	do	Noodles (mixed flour), A. P			28.30	20.21	1.60	44.82	1.30	3.77	1,233	274
37	Kua-mien	Vermicelli (wheat flour) A. P			13.61	11.21	1.32	69.24	0.49	4.13	1,503	334
		Bread, Pastry, etc.:										
55	Man-t'ou (Mo-mo)	Steamed bread, A. P			38.87	8.24	0.09	52.01	0.06	0.73	1,089	242

54	Kuo-ping	Baked bread (large loaf) (wheat flour), A. P.			30.06	9.80	0.23	58.74	0.29	0.88	1,242	276
96	Shao-ping	Baked bread (small loaf), A. P.			23.79	8.30	1.46	65.11	0.19	1.15	1,381	307
56	Wo-wo-t'ou (P'a-ku)	Bean-millet bread, A. P.			39.97	10.85	3.61	43.07	1.22	1.28	1,116	248
57	Chien-ping	Fried bread (thin sheets), A. P.			22.73	11.77	2.70	60.54	0.80	1.46	1,408	313
62	Mien-chin	Wheat gluten, A. P.			74.79	22.44	0.15	1.33	0.55	0.74	432	96
85	Yu-ping	Oil cakes, A. P.			40.45	5.22	6.89	44.65	0.46	2.33	1,175	261
94	Yu-kuo	Doughnuts, A. P.			9.90	5.10	30.03	53.21	0.23	1.53	2,250	500
103	Kuo-t'ieh	Dumpling (fried), A. P.			57.04	6.17	10.44	24.44	0.52	1.39	972	216
98	Chi-tan-kao	Sponge cake, A. P.			24.30	10.87	8.21	55.81	0.06	0.75	1,530	340
		Beans and bean products:										
82	Hei-tou	Soy bean (black variety), A. P.	*Glycine hispida*		8.42	42.92	12.56	25.96	6.21	3.93	1,746	388
20	Chiang-yu	Soy (from soy bean), A. P.			57.00	9.54	9.00	4.09		20.57	598	133
22	Tou-chiang	Bean condiment (from soy bean), A. P.			45.04	18.94	10.08	1.48	1.98	22.48	774	172
24	Tou-fu-p'i	Bean curd skin (from soy bean), A. P.			5.66	50.99	21.24	17.57		4.54	2,083	463
25	Ch'ien-chang-tou-fu	Sheet bean curd (from soy bean), A. P.			64.59	20.28	7.36	4.27	0.08	3.42	738	164
26	Tou-fu-nao	Bean curd bran (from soy bean), A. P.			94.42	3.33	1.18	0.50		0.57	117	26
27	Fu-ju	Bean curd pickle (from soy bean), A. P.			53.68	17.60	8.82	4.55		15.35	751	167
29	Tou-ch'ih	Bean relish (from soy bean), A. P.			29.84	32.68	14.14	4.76	2.41	16.17	1,242	276
58	Lü-tou	Green beans, A. P.	*Phaseolus mungo*		4.52	22.31	1.04	64.90	4.26	2.97	2,696	599
71	Lü-tou-ya	Bean sprouts (from green beans), A. P.	do.		92.50	2.77	0.35	2.78	1.07	0.53	112	25
59	Kan-fen	Bean starch (strips) (from green beans), A. P.			10.41	0.65	0.20	88.10	0.36	0.28	1,606	357
60	Fen-p'i	Bean starch (sheets) (from green beans), A. P.			16.92	0.61	0.06	81.51	0.75	0.15	1,481	329

TABLE 2.—*Analyses of Chinese food materials (vegetable food)*—Continued.

Analysis No.	Food materials.			Refuse.	Water.	Protein N × 6.25.	Fat.	Nitrogen-free extract (carbohydrates).	Fiber.	Ash.	Fuel value (calculated).	
	Chinese name (Peking romanized).	English name.	Botanical name.								Per pound.	Per 100 grams.
		Beans and bean products—Ctd.										
61	Yang-fen	Bean starch (from green beans), A. P		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Calories*	*Calories*
99	Fen-t'iao	Do			2.85	1.53	0.19	94.23	0.53	0.67	1,733	386
88	Pai-pien-tou	Do			0.08	3.09	0.16	96.02	0.31	0.34	1,787	397
110	Ch'ing-tou	Flat bean, A. P	*Dolichos lablab*		11.34	17.93	1.77	57.04	8.90	3.02	1,422	316
		Soy bean (green variety), A. P	*Glycine hispida*		6.38	37.34	18.33	29.56	3.38	5.01	1,940	431
111	Pai-chiang-tou	Do	*Vigna sinensis*		10.34	21.25	2.16	58.53	4.32	3.40	1,525	339
112	Hei-chiang-tou	Do	do		9.14	22.64	2.14	58.42	4.15	3.51	1,548	344
113	Hsiao-tou	Red bean, A. P	*Phaseolus radiatus*		10.34	18.31	1.32	63.05	3.73	3.25	1,516	337
114	Ts'an-tou	Horse bean, A. P	*Vicia faba*		7.51	25.60	2.81	51.76	8.80	3.52	1,503	334
		Vegetables:										
50	Ou	Lotus root, A. P	*Nelumbium speciosum*		86.72	1.66	0.09	9.67	0.76	1.10	212	47
101	Ou-fen	Lotus root flour, A. P	do		10.19	0.78	0.53	87.49	0.31	0.70	1,611	358
63	Shan-yao	Yam, A. P	*Dioscorea batatas*		76.80	2.21	0.06	19.63	0.61	0.69	396	88
118	Hung-shu	Sweet potato, A. P	*Ipomoea batatas*		81.60	1.34	0.05	16.23	0.31	0.47	320	71
68	P'o-ch'i	Water chestnut, E. P	*Eleocharis tuberosa*		79.20	1.84	0.18	17.12	0.70	0.96	347	77
	do	Water chestnut, A. P	do	16.48	66.14	1.53	0.15	14.32	0.58	0.80	288	64
64	Pai-ts'ai	Cabbage, A. P	*Brassica chinensis*		95.42	1.21	0.06	1.99	0.76	0.56	63	14
122	Pai-lo-po	Turnip, A. P	*Raphanus sativus*		93.56	1.68	0.02	2.94	1.16	0.64	85	19
79	Ch'ieh-tzu	Eggplant, E. P	*Solanum melongena*		93.26	2.31	0.07	3.05	0.77	0.54	99	22
	do	Eggplant, A. P	do	3.86	89.66	2.22	0.06	2.94	0.74	0.52	95	21
89	Ch'in-ts'ai	Celery, E. P	*Apium graveolens*		94.62	1.76	0.20	1.04	0.58	1.80	58	13
	do	Celery, A. P	do	28.05	68.08	1.26	0.14	0.75	0.42	1.30	41	9
119	Wo-chü	Chinese lettuce, A. P	*Lactuca sativa*		93.23	0.47	0.04	5.06	0.61	0.59	104	23
72	P'u-ts'ai	Bulrush, E. P	*Acorus calamus*		96.24	0.88	0.12	1.16	0.65	0.95	41	9

	do	Bulrush, A. P	do	44.84	53.08	0.48	0.06	0.65	0.36	0.53	23	5
95	Huang-hua-ts'ai	Yellow day-lily, A. P	*Hemerocallis aurantiaca*		8.56	12.65	1.87	59.00	12.27	5.65	1,364	303
109	Po-ts'ai	Spinach, E. P	*Spinacia oleracea*		93.85	1.86	0.20	1.78	0.51	1.80	72	16
	do	Spinach, A. P	do	12.80	81.83	1.62	0.17	1.56	0.44	1.58	63	14
87	Mu-erh	Mushroom, A. P	*Peziza auricula*		14.90	11.28	2.02	61.51	8.37	1.92	1,391	309
		Fruits, nuts, etc.:										
74	Hsing	Apricot, E. P	*Prunus armeniaca*		85.00	1.15	0.03	11.11	1.88	0.83	220	49
74	do	Apricot, A. P	do	44.36	47.29	0.64	0.02	6.19	1.04	0.46	126	28
97	Shih-tzu	Persimmon, E. P	*Diospyros kaki*		82.75	0.74	0.08	10.51	3.06	2.86	198	44
	do	Persimmon, A. P	do	14.14	71.05	0.63	0.07	9.03	2.62	2.46	176	39
80	Hei-tsao	Dates, E. P	*Zizyphus jujuba*		14.98	7.07	0.94	67.52	6.64	2.85	1,382	307
	do	Dates, A. P	do	13.83	12.90	6.09	0.81	58.19	5.72	2.46	1,193	265
69	Lien-tzu	Lotus seeds, A. P	*Nelumbium speciosum*		4.82	15.92	2.82	70.06	2.50	3.88	1,661	369
75	Pei-kua-tzu	Pumpkin seeds, E. P	*Cucurbita moschata*		0.46	35.97	32.62	24.04	2.42	4.49	2,385	530
	do	Pumpkin seeds, A. P	do	25.69	0.34	26.74	24.23	17.86	1.80	3.34	1,755	390
76	Hsi-kua-tzu	Watermelon seeds, E. P	*Citrullus vulgaris*		10.34	30.84	44.66	5.73	3.76	4.67	2,468	544
	do	Watermelon seeds, A. P	do	62.78	3.84	11.48	16.62	2.14	1.40	1.74	905	201

STUDIES ON THE SEROLOGY OF LEPROSY, III

THE KAHN PRECIPITATION REACTION IN LEPROSY [1]

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Recent reports [2] to the effect that the Wassermann reaction is negative in leprosy uncomplicated by treponematous infection, corroborated by our findings [3] at least for the ordinary phases of the disease, are contrary to the usual belief that infection with *Mycobacterium lepræ* per se gives rise to this reaction. So firmly established is this belief that corroboration by means of another test used in the diagnosis of syphilis is desirable.

Of the many other tests advocated for the serum diagnosis of syphilis, the Kahn precipitation reaction has recently received most favorable reports. It is apparently specific and sensitive,[4] and is certainly simple and less liable to technical and

[1] Published with the permission of the Director of Health, on recommendation of the Philippine Leprosy Research Board.

[2] Mathis, C., La reaction de Wassermann dans la lépre. Troisième Conference International Scientifique de la Lépre, Strassbourg, 1923. Paris, J. B. Ballière et Fils (1924) 229–231.

Kolmer, J. A., and O. E. Denney, Arch. Derm. & Syph. 8 (1923) 63.

[3] Philip. Journ. Sci. 30 (1926) 39–57.

[4] Keim, H. L. and U. J. Wile, The Kahn precipitation test in the diagnosis of syphilis, Journ. Am. Med. Assoc. 79 (1922) 870.

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other errors than is the Wassermann reaction. It is therefore well suited to the purpose of determining whether in leprosy there are produced reacting bodies of similar nature to those characteristic of treponematous infections.

It has been so used by Yagle and Kolmer [5] on the sera of twenty-eight cases of leprosy, with regularly negative results in cases uncomplicated with treponematous infections. More recently Hasseltine [6] also used it in this connection; but, as he was not satisfied with his technic, he did not arrive at any definite conclusion. In the present paper are reported our findings with this test. The Wassermann reaction was performed in parallel on all sera.

Material.—Sera from two hundred fifty cases of leprosy were tested (see Table 1). These were unselected, except that a considerable number (fifty-four) of lepra-reaction cases was included, because a small proportion of this group were weakly or doubtfully positive with the Wassermann reaction. The majority were under anti-leprosy treatment. Eighteen were on the "negative list" and were ready for parole. All were carefully questioned and examined for any evidence of treponematous infection.

Technic.—The technic followed was the improved one described by Kahn.[7] During the early part of the work a cholesterinized antigen kindly supplied by Doctor Kahn was used; later an antigen was prepared in the Culion laboratory that gave identical results when tested in parallel with the first. Only the averages of the three tube readings are here reported. It was noted that in some instances the largest amount of precipitation occurred in the first tube, while it was distinctly less in the two tubes having a higher serum antigen dilution, which is contrary to the rule. Ishii [8] noted similar results.

Results.—The results are summarized in Table 1. The cases were divided into three groups; one suspected of having syphilis, one of having yaws, and one in which there was no distinct clinical evidence of either of these diseases.

As has been stated by us in a former paper,[9] the larger number of cases giving evidence of yaws (seventeen) than of syphilis (eleven) is in conformity with existing conditions in the

[5] Arch. Derm. & Syph. **8** (1923) 183–185.
[6] Pub. Health Bull. No. 141 (1924) 27–49.
[7] Am. Journ. Pub. Health (June, 1924) 491.
[8] Arch. Derm. & Syph. **9** (1924) 612.
[9] Philip. Journ. Sci. **30** (1926) 53.

Philippine Islands, syphilis being found chiefly in the larger cities while yaws is endemic and prevalent in many localities in the provinces.

TABLE 1.—*Cases of leprosy whose sera were tested.*

Cases examined.	Number of cases.	Positive Kahn.	Negative Kahn.
No suspicion of syphilis or yaws	222	8	214
Yaws suspected	17	17	0
Syphilis suspected	11	11	0
Total	250	36	214

In every case where either of these complications was diagnosed or suspected a positive reaction was obtained. These diagnoses were not made on highly doubtful evidence; that would not be justifiable in the presence of a disease such as leprosy. It is therefore to be expected that some of those passed as not suspicious should give positive reactions, particularly since many of these patients are very ignorant. However, this occurred in but eight out of two hundred twenty-two cases of leprosy of various types and stages of development. Data on the apparently uncomplicated cases showing positive reactions are given in Table 2.

In Tables 2, 3, and 4 the following abbreviations are used:

M = mixed.
C = cutaneous.
N = neural.
Mod = moderate.
Mkd = marked.
Sl = slight.

TABLE 2.—*Cases of leprosy, without history or clinical evidence of syphilis or yaws, giving positive Kahn reaction.*

No.	Age.	Leprosy.				Kahn reaction.[a]	Wassermann reaction.[b]
		Type.	Stage.	Duration.	Bacteriological examination.		
	Yrs.			*Yrs.*			
1	23	M	Mod	2	+	4+	4+
2	65	M	Mkd	9	+	4+	4+
3	45	M	Mod	3	+	4+	4+
4	13	M	Mkd	5	+	3+	3+
5	15	M	Sl	5	+	2+	1+
6	35	M	Mod	?	+	4+	3+
7	22	M	Mod	7	+	4+	4+
8	38	M	Mod	6	+	4+	4+

[a] Average of three tube readings. [b] Kolmer standardized technic.

With a single exception these uncomplicated cases gave very strongly positive Kahn reactions, and the Wassermann reactions were also strong. In the exceptional case the leprosy was very slight, and could hardly be expected to give rise to a false positive reaction; furthermore, there were scars on the legs of this patient suspicious of yaws. Four of these cases were Moros among whom, as stated in the former paper, yaws is very common. The remaining three cases were rendered negative by neoarsphenamine injections, indicating treponematous infection. In our work with the Wassermann reaction we arrived at the conclusion that the cases that gave strongly positive reactions were suffering from either yaws or syphilis, and the evidence in the present instance points strongly to the same conclusion.

Data on the cases suspected of having yaws are given in Table 3. It is to be noted that the Kahn precipitation reaction, like the Wassermann reaction, is positive in cases of yaws, and that on the whole it is as strongly positive as is the Wassermann.

TABLE 3.—*Cases of leprosy complicated with yaws.*

No.	Age.	Leprosy.				Kahn reaction.[a]	Wassermann reaction.[b]
		Type.	Stage.	Duration.	Bacteriological examination.		
	Yrs.			*Yrs.*			
1	17	M	Mkd	6	+	4+	4+
2	30	M	Mod	3	+	2+	3+
3	59	M	Mod	4	+	4+	4+
4	25	M	Mkd	3	+	2+	3+
5	26	M	Mkd	15	+	4+	4+
6	45	M	Mod	4	+	4+	4+
7	24	N	Mkd	13	—	4+	4+
8	14	M	Mkd	6	+	4+	4+
9	34	M	Mod	9	+	4+	4+
10	35	M	Mkd	9	+	4+	4+
11	17	M	Mkd	11	+	4+	4+
12	26	N	Mod	11	+	4+	4+
13	24	M	Mod	14	+	3+	3+
14	35	M	Mkd	12	+	3+	2+
15	17	M	Sl	10	+	3+	4+
16	23	M	Mkd	9	+	2+	4+
17	22	M	Mod	5	+	4+	4+

[a] Average of three tube readings. [b] Kolmer standardized technic.

Data on the eleven cases complicated with syphilis are given in Table 4. It is interesting to note that both the Kahn and

the Wassermann reactions are weaker in this group than in the yaws group. In these cases the infection was in a latent form; none of them showed acute manifestations of syphilis. There is a general impression among laboratory workers in the Philippines that in latent yaws the serum reacts more strongly than in latent syphilis as found in the general run of cases among the native population. The results obtained seem to bear out this belief.

TABLE 4.—*Cases of leprosy complicated with syphilis.*

No.	Age.	Leprosy.				Kahn reaction.[a]	Wassermann reaction.[b]
		Type.	Stage.	Duration.	Bacteriological examination.		
	Yrs.			*Yrs.*			
1	51	M	Sl	4	+	3+	4+
2	31	M	Mod	10	+	2+	1+
3	44	M	Mod	9	+	4+	±
4	45	M	Mod	2	+	3+	4+
5	34	C	Sl	5	+	3+	2+
6	27	N	Mkd	10	—	2+	4+
7	28	M	Mkd	18	+	3+	3+
8	28	M	Sl	3	+	3+	2+
9	25	M	Mod	4	+	3+	3+
10	55	M	Mkd	15	+	3+	3+
11	35	M	Mkd	9	+	4+	2+

[a] Average of three tube readings. [b] Kolmer standardized technic.

Lepra reaction.—A point of interest is that the Kahn test has not given any doubtfully positive results in cases of lepra reaction as did the Wassermann reaction. Fifty-four cases of lepra reaction are included in this group. Nine sera from these gave doubtful or weakly positive Wassermann reactions, while the precipitation test was negative in all. After an interval of time, during which in most of the cases the lepra reaction had subsided, retests were made. In seven the Wassermann reaction had become entirely negative; but in two, in which the lepra reaction had persisted, the Wassermann still gave plus-minus readings. The precipitation reaction was again negative.

Effect of antitreponematous treatment.—Fourteen of the patients giving positive Kahn reactions were given antitreponematous treatment and their sera were retested one or more times. Data on these cases are given in Table 5.

TABLE 5.—*Kahn reaction before and after treatment with neoarsphenamine.*

No.	Clinical diagnosis.	Reaction before treatment.	Injections.	Time interval, last injection.	Reaction after treatment.
				Months.	
1	Yaws	4+	5	8	1+
2	do	4+	7	3	—
3	do	4+	6	3	—
4	do	3+	7	3	[a]—
5	do	2+	4	3	—
6	do	4+	8	2	[a]2+
7	Syphilis	4+	8	4	—
8	do	3+	8	4	—
9	do	2+	3	3	—
10	do	2+	6	2	—
11	do	4+	3	2	—
12	(?)[b]	4+	6	4	—
13	(?)[b]	4+	10	2	±
14	(?)[b]	4+	7	2	—

[a] Active lesions healed. [b] No clinical evidence of treponematous infection.

In twelve of these patients, including three of those in whom no definite clinical evidence of treponematous complications had been detected, the reaction became negative. In the other two it showed distinct diminution in strength; these were cases of yaws.

DISCUSSION

It has been recognized that the Kahn precipitation test has the same diagnostic value as has the Wassermann test in the serum diagnosis of syphilis, and Kolmer [10] has come to believe that the mechanism of the two reactions is probably essentially the same. It is reasonable, therefore, to expect that if leprosy per se were to give rise to the Wassermann reaction, as is believed by many, this reaction would also be positive, and would therefore be a valuable check on the former.

Our results are in conformity with those of Yagle and Kolmer, in that the Kahn precipitation reaction is consistently negative in uncomplicated leprosy. This is true even in cases suffering from lepra reaction, in which in some cases we obtained weakly positive Wassermann reactions. Therefore, we have further reason to believe that these reactions were not specific, but were due to errors inherent in the relatively complicated technic of the Wassermann reaction, coupled with unusual abnormalities

[10] Infection, Immunity and Biologic Therapy, 3d ed. Philadelphia, W. B. Saunders Co. (1923) 534.

of the serum in this peculiar condition. Obviously, sera of lepers have an increased tendency to fix complement, especially when a highly reënforced crude alcoholic antigen is used, though in the ordinary phases of the disease this can be overcome by the close adjustment of the various reagents used. That the weakly positive Wassermann reactions obtained by us in lepra reaction are due to this abnormal tendency of the serum and not to a true reagin production is indicated by the transitory character of such positive reactions and by the negative precipitation test. This is in keeping with the report of Clegg [11] that lepers in whom the Wassermann reaction was found positive gave negative luetin tests. Since the Kahn precipitation reaction is not influenced by this abnormality, we believe that it is of more value than the Wassermann for the detection of complicating yaws or syphilis in cases of leprosy.

That the positive reactions obtained were due to treponematous complications is indicated by the fact that there was clinical evidence of such infection in twenty-eight of the thirty-six cases that gave such results, and the further fact that neoarsphenamine treatment of several of those cases caused the clinical symptoms of treponematous complications to disappear, and in most cases caused the serological tests to become negative. The positive reactions in the eight cases not suspected of such complications we believe cannot be ascribed to leprosy. The clinical diagnosis could well have been missed; there was unusual probability of yaws infection in four (Moros); the reactions were strong except in a single case, with very slight leprosy but with scars, possibly of yaws; and, finally, treatment of three unselected individuals of this group changed the reaction to negative.

SUMMARY

Two hundred fifty sera from cases of leprosy were tested with the Kahn precipitation reaction. Two hundred fourteen were negative; thirty-six were positive in some degree, twenty-eight of whom were clinically positive for yaws or syphilis. Antitreponematous treatment of fourteen of the positive cases caused the reaction to become negative in twelve (including three of the eight cases that had given no distinct evidence of syphilis or yaws) and lessened the reaction in the other two. Fifty-four cases of lepra reaction are included in this series; all gave negative results.

[11] Pub. Health Bull. 61 (July, 1913) 11–14.

CONCLUSIONS

1. The Kahn precipitation reaction is negative in uncomplicated cases of leprosy.

2. It gives no doubtfully positive reaction in cases suffering from lepra reaction.

3. It is therefore preferable to the Wassermann reaction for the detection of complicating treponematous infections in lepers.

4. In leprosy there is no production of a reagin similar to that in yaws or syphilis.

5. Incidentally, the Kahn precipitation reaction has been found to be positive and to have the same value as the Wassermann reaction in the serum diagnosis of yaws.

ACKNOWLEDGMENTS

We are indebted to Dr. R. L. Kahn for supplying us with antigen and other material with which this work was started, and to Dr. H. W. Wade, chief pathologist of the Culion Leper Colony, for help in the preparation of this paper.

A NOTE ON THE PROBLEM OF PAINTING IPIL WOOD

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INTRODUCTION

Ipil (*Intsia bijuga* O. Ktze.) is classified by the Bureau of Forestry as having durability I. It is one of the best structural timbers of the Philippine Islands. The universal disadvantage associated with its use is due to the coloring matter which the wood contains. The coloring matter is so easily soluble in water that during the rainy season it leaches from the wood and stains the surfaces over which the rain water containing it runs. Concrete pillars are stained at first a dirty red, later changing to an unsightly dark brown. Surfaces painted white are very badly discolored. The only reference in the literature to the coloring matter of ipil is by Brooks,[1] who states that—

> * * * The coloring matter reacts like a tannin, giving a black precipitate with ferric chloride and an abundant flocculent precipitate with gelatine solution. Owing to the limited supply of this wood and its value as building material, its virtues as a dye wood were not further investigated.

It is because of this troublesome coloring matter that the experiments here reported were undertaken.

Ipil wood was formerly exported to Holland in considerable quantities, but for what particular purpose I was not able to learn from any book or periodical now in the Bureau of Science library.

The nature of the coloring matter.—One of the most characteristic things about a piece of ipil is the small yellow deposits in the pores. They have been described as sulphur yellow deposits. This yellow substance is easily extracted from the wood or the sawdust by ether or chloroform. It is insoluble in water and has nothing to do with the red coloring matter of the wood. It is undoubtedly a wood resin or wax. It is soluble in carbon bisulphide, benzene, and absolute alcohol, but only partly so in acetone. A chloroform solution has no rotary power. The

[1] Philip. Journ. Sci. § A 5 (1910) 447.

substance melts, darkens in color, gives off a characteristic odor, and burns with a smoky flame but leaves no ash. Toward litmus paper it is very slightly acid. The chloroform and the ether solutions are both yellow, but wool is not dyed by an acid ether-chloroform solution. Four hundred twenty grams of ipil sawdust gave 2.65 grams of the yellow substance when extracted in a Soxhlet apparatus with chloroform. This corresponds to a yield of 0.64 per cent. Cold ether dissolves the yellow substance from the extracted material and leaves behind a whitish waxlike residue.

The red coloring matter, which discolors the painted wood, is a tannin of the phlobatannin class. A solution of the red coloring matter yields a precipitate with tin, iron, zinc, copper, and lead salts. With ferric chloride, it gives a greenish coloration, then a blackish precipitate. The precipitate formed with basic lead acetate is soluble in dilute acetic acid. Bromine yields a precipitate. The formaldehyde-hydrochloric acid test indicates that it is a catechol tannin. When the tannin solution is coupled with diazotised aniline, a brownish dye is formed. A precipitate is produced if the tan liquor is allowed to stand with a solution of aniline hydrochloride.

When four blocks 4.5 by 2 by 5 centimeters, weighing approximately 180 grams, had been soaked twenty-four hours in 500 cubic centimeters of distilled water, the tannin solution decanted from the blocks, diluted to 500 cubic centimeters in a standard flask, heated to 80° C., cooled to room temperature, and the tannin determined by the method of the American Leather Chemists' Association, the results shown in Table 1 were obtained.

TABLE 1.—*Results of soaking experiments with ipil.*

Experiment No.	Number of blocks.	Weight.	Time of soaking.	Tan liquor diluted to.	Soluble solids in liquor.	Non-tannin.	Tannin in liquor.	Tannin extracted.
		g.	*Hrs.days.*	*cc.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1	4	185	24	500	0.502	0.159	0.343	0.927
2	4	188	24	500	0.510	0.161	0.349	0.928
3	4	174	5	500	1.041	0.338	0.703	2.08
4	4	174	5	500	1.034	0.343	0.691	1.87

These quantitative results support a rough qualitative experiment in which some ipil sawdust was placed in a test tube, twice the volume of distilled water added, vigorously shaken, and then filtered. Twice the volume of distilled water was then

added, and the mixture was shaken and filtered. This operation was repeated twice more. If a value of 100 be assigned to the color of the sawdust, then the aqueous extracts could be represented by the following values: No. 1, 200; No. 2, 90; No. 3, 45; and No. 4, 30.

The tan liquor is darkened by making the solution alkaline, but the color is lightened again by acidification. The stains produced on concrete are readily explained when one remembers that concrete in "setting" liberates large quantities of calcium hydroxide.

The best way to prevent the leaching of ipil wood is to remove the tannin entirely, or at least to the extent that the paints used will have sufficient covering power to hold back the residual coloring matter; or to devise a paint that is impervious to water.

RESULTS OF EXPERIMENTS

All of the experiments here discussed were conducted on small blocks of wood, such as were used for the tannin determinations. Since a very large precipitate was formed with an iron sulphate or a gelatine solution, an attempt was made to close the pores by soaking the wood in these solutions. The precipitate that formed closed the pores fairly well, but some of the precipitate remained adhering to the wood so that, before painting, it was necessary to brush the surface of the lumber with a strong bristle brush to remove the precipitate to avoid the peeling of the paint after it was applied. This procedure was considered too expensive for practical work.

Many experiments were tried with brea, shellac, rosin, resinates, copal, and dammar resins, using amyl alcohol, amyl acetate, acetone, alcohol, benzene, gasoline, and ethyl acetate as solvents. Brea and rosin yielded a varnish less sticky than a pure brea varnish and not so brittle as a straight rosin varnish, but it tended to swell and whiten when soaked in water.

Fine aluminum powder mixed with white lead paint improved the covering power of the paint much more than when mixed with a red lead or a lithopone-calcium carbonate paint. The best single paint was red lead paint (75 grams red lead with 25 grams boiled linseed oil). Two coats of this paint proved entirely satisfactory.

Painting the wood with a dilute solution of iron sulphate, allowing this to dry, and then painting in the regular way, increased the covering power of the paint considerably. It was better than a dilute solution of aniline hydrochloride. A 10 per

cent solution of paraffine in kerosene was less efficient than a dilute solution of aniline hydrochloride. A paint composed of two pigments was found to be better than the use of each one separately would indicate.

Many things aid a paint to hold in the coloring matter. One substance will not aid different paints to the same degree. Dr. T. Dar Juan, a chemist of the Bureau of Science, tried the iron sulphate treatment on his residence in 1919, and he reports it to be entirely satisfactory. Many formulas will no doubt be suggested for painting ipil wood, but all must depend on being water-tight or on precipitating the tannin if the wood is unleached wood. Painting the wood with lead acetate solution is also effective, but is more expensive than the iron sulphate treatment.

RECOMMENDATIONS

The following recommendations are offered:

1. Leach the wood, if possible, by allowing it to remain in a stream for several days or by allowing it to pass through a rainy season uniformly exposed or already erected.

2. Paint with a dilute aqueous solution of iron sulphate (about 4 per cent).

3. Paint, if possible, with an undercoat of red lead paint, using 75 parts pigment to 25 parts by weight of boiled linseed oil.

4. Try to use a mixture of pigments instead of only one pigment in the paint. This does not mean, however, that a pigment of good covering power should be used with one of poor covering power.

5. Be sure to paint the surface uniformly, being especially careful about cracks. Joints should be painted at the time of erection.

THE VITAMIN B CONTENT OF SOME PHILIPPINE FRUITS AND VEGETABLES, II [1]

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THREE TEXT FIGURES

INTRODUCTION

The prevention of beriberi is still an unsolved problem. Based on our present knowledge of the disease, two possible methods of solution present themselves; namely, the enactment of legislation prohibiting the polishing of rice, and the education of the people as to proper food selection.

The solution by legislation will meet two important obstacles which are difficult to surmount; namely, the people are already accustomed to eating polished rice and unpolished rice does not look appetizing, and the rice merchants are unwilling to carry unpolished rice in stock because it is believed to deteriorate easily. The experiments on the keeping quality of unpolished rice that are being conducted in this laboratory seem to show that it really can not be kept as long as can polished rice. Furthermore, merchants are unwilling to carry unhusked rice, because of the added transportation expenses entailed and the increased storage facilities that would be required.

The solution by education is slow, but at the same time sure. It is the method advocated by the Far Eastern Association of Tropical Medicine (1923). There are schools in every barrio in the Philippines. By proper direction, instruction in adequate food selection can be given in the schools. The Bureau of Agriculture, the Bureau of Health, and the Public Welfare Commissioner can all lend a helping hand in bringing this about.

However, before proper food selection can be successfully taught, it is necessary that the food values of the available materials be known. Our experience in the laboratory has shown that some fruits and vegetables, generally considered to

[1] Experiment Station contribution No. 358. Published with the permission of the Director of the Experiment Station at Los Baños.

be good sources of vitamin B, are poor in this essential. Further, it is generally accepted that beriberi is due, either directly or indirectly, to the lack of vitamin B in the diet or to an infection by some organism made possible by the deficiency of this vitamin. In view of these facts, it seems highly desirable to test further for the presence of this food factor in Philippine food materials.

This paper is the second report on the determination of vitamin B content of Philippine fruits and vegetables. All of the work was done in the College of Agriculture, from July 18, 1923, to January 20, 1925.

Some of the food materials that are used in the United States and in Europe are also used in the Philippines. Their vitamin B content is given by Sherman and Smith.(10) The following Philippine food materials have also been tested for vitamin B:

By Santos:(8) Mungo (*Phaseolus mungo* Linnæus), togi (sprouted mungo); okra [*Abelmoschus esculentus* (Linnæus) Moench]; avocado (*Persea gratissima* Gaertner); bamboo shoots (*Bambusa* sp.); sweet potato leaves [*Ipomœa batatas* (Linnæus) Poir.]; duhat (*Eugenia jambolana* Lam.); artichokes (*Cynara scolymus*); bilimbi (*Averrhoa carambola* Linnæus); and banana flower bud (*Musa sapientum* Linnæus).

By Derecho:(2) Copra meal.

By Acuña:(1) Paayap (*Vigna sinensis* Linnæus); banana; papaya (*Carica papaya* Linnæus); and paco (*Ethyrium esculentum*).

MATERIALS AND METHODS

The biological method, generally accepted for the determination of vitamin B, was used.(10) The qualitative test recently reported by Jendrassik(4) was also used in this work.

THE FEED

Basal diet.—The basal diet had the following ingredients: Corn starch, 64 grams; casein, 18; butter fat, 9; lard, 3; salt mixture, 4; and filter paper, 2.

"Liberty" brand corn starch, which is obtainable in the local market, was used. The casein, imported from Merk and Company, was ground into powder and washed five times with rain water. The filter paper was soaked in water, macerated, ground in a meat grinder, and then dried in the sun. The butter fat was prepared from Golden State butter.

The salt mixture had the following composition:(5) Sodium chloride, 5 grams; potassium biphosphate, 12.1; primary calcium phosphate (monohydrate), 2.56; calcium lactate, 29.44; and iron citrate, 1.

Supplements to basal diet.—The vegetables used in this investigation were paco (*Diplazium esculentum* Swartz); balunsay (*Celosia argentea* Linnæus); and uray babae (*Amaranthus viridis* Linnæus).

The chemical analyses of these vegetables are presented in Table 1.

TABLE 1.—*Chemical analyses*[a] *of vegetables used in the experiment.*

Vegetable.	Moisture.	Fat.	Ash.	Protein.	Crude fiber.	Carbohydrates.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Paco	89.98	2.62	1.36	3.51	1.08	1.45
Balunsay	89.23	0.52	1.67	3.22	1.47	3.89
Uray babae	78.89	0.78	3.55	6.24	1.47	9.07

[a] By Chemistry Department, College of Agriculture, Los Baños.

In preparing the supplements the plants were dried in the sun. After drying they were ground fine through a meat grinder.

In the latter part of the experiment the supplements were extracted according to the method of Susuki, Shimamura, and Odake.(11)

Control sources of vitamin B.—Three control sources of vitamin B were used; namely, yeast, tikitiki,(9) and camote leaves.(8) Tikitiki, furnished by the Bureau of Science, Manila, was used in quantities of 0.5 cubic centimeter and 1 cubic centimeter. One tablet (0.2 gram) of Harris yeast vitamin, prepared according to the method of Osborne and Wakeman,(6) was given daily to animals under treatment. The camote leaves were dried in the sun and then ground fine. One gram of this food was given, and toward the close of the experiment the ration was increased to 2 grams.

EXPERIMENTAL ANIMALS

White rats were used as the experimental animals. Healthy ones were selected, and they were kept in separate cages. They were divided into three groups, one group for each supplement to be tested.

FEEDING TECHNIC

The feeding technic was essentially the same as that reported by Ferry.(3) The experimental animals were first given a basal diet deficient in vitamin B. When they had declined in weight to a point where they looked physically weak, known quantities of the materials that were being tested were given as daily supplement to the basal ration. If on the supposedly corrected feed no improvement in the weight and appearance of the animals was noticed, the daily supplement was replaced by known rich sources of vitamin B. This was done to show that the real cause in the further decline of the animal was due to lack of vitamin B in the material that was being tested, and not to other causes. Sometimes healthy animals were given the basal ration plus the material under investigation at the commencement of the experiment, and the change in weight noted.

Records of basal food intake and body weights were taken twice a week.

Either rain water or boiled water was given to the animals, ad libitum.

EXPERIMENT AND RESULTS

Protocols of body weight and food intake are given in Tables 2, 3, and 4. The body weights of some of the rats are also presented graphically in figs. 1, 2, and 3. The behavior of the individual animals is described in detail in the Appendix.

In the tables the letters y, x, xx, and z precede some of the weight figures, and are to be interpreted thus:

y, basal ration alone.
x, basal ration plus 1 gram supplement.
xx, basal ration plus extract corresponding to 2 grams supplement.
z, basal ration plus control source of vitamin B.

KEY TO TEXT FIGURES

y ————, basal ration alone.
x— — —, basal ration plus 1 gram supplement.
xx, — — —, basal ration plus extract corresponding to 2 grams supplement.
z — - — - —, basal ration plus control source of vitamin B.
○, beginning in change of ration.

FEEDING TESTS

Paco.—The four animals (Nos. 1, 2, 3, and 4) given this food continued to decrease in weight when this supplement was added to the basal diet. All except rat 1, which died early, were put to the test more than once, and always failed to increase in weight. (See Table 2 and fig. 1.) Even with amounts corre-

TABLE 2.—*Paco: Body weight and biweekly intake of basal ration.*

Date.	Body weight.	Intake of basal ration.
RAT 1 ♂.		
1923	*Grams.*	*Grams.*
July 18	120	
July 31	106	98
August 14	100	54
August 28	98	81
September 11	126	115
September 25	142	128
October 9	125	73
October 23	103	50
November 6	x93	59
November 20	84	48
December 4	81	49
December 6	[a]	
RAT 2 ♀.		
1924		
April 12	117	
April 26	108	65
May 10	103	68
May 24	x93	79
June 7	z72	50
June 21	94	84
July 1	y94	
July 5	92	39
July 19	z96	50
August 2	170	120
August 9	x185	
August 16	191	99
August 30	131	53
September 9	z106	
September 13	111	40
September 27	150	110
October 11	187	97
October 25	200	126
November 8	y206	129
November 22	170	87
November 29	xx147	
December 6	z124	46
December 20	193	140
1925		
January 3	208	156
January 17	235	165
RAT 3 ♂.		
1924		
July 22	z93	
July 29	129	73

Date.	Body weight.	Intake of basal ration.
RAT 3 ♂.		
1924	*Grams.*	*Grams.*
August 12	x163	115
August 26	144	70
September 9	129	67
September 23	z115	72
October 7	131	120
October 21	y172	134
November 1	xx169	
November 4	170	99
November 18	149	117
December 2	110	49
December 6	z109	
December 16	132	116
December 30	157	140
1925		
January 13	199	161
January 20	203	
RAT 4 ♂.		
1924		
March 22	88	
April 5	76	48
April 19	x61	36
May 3	53	44
May 6	z53	
May 17	62	60
May 30	78	73
June 14	y80	59
June 28	x74	45
July 12	z57	52
July 26	110	97
August 9	x150	130
August 23	142	82
September 6	z106	45
September 20	122	97
October 4	159	86
October 18	166	98
November 1	171	117
November 15	xx175	120
November 29	z137	72
December 13	141	193
December 27	165	145
1925		
January 10	200	128
January 20	203	

[a] Died.

sponding to 2 grams dry weight the animals did not improve. This shows that paco is deficient in vitamin B for the growth of rats.

Balunsay.—The result with balunsay was practically the same as that with paco. The noticeable difference between the two is that two of the animals (Nos. 7 and 8) treated with balunsay maintained their weights for a longer time than did the animals treated with paco, before signs of weakness were observed. (See Table 3 and fig. 2.) This result seems to indicate that balunsay contains some vitamin B, but the amount used was probably enough for maintenance only and not for growth. This statement is supported by the result of the color test.

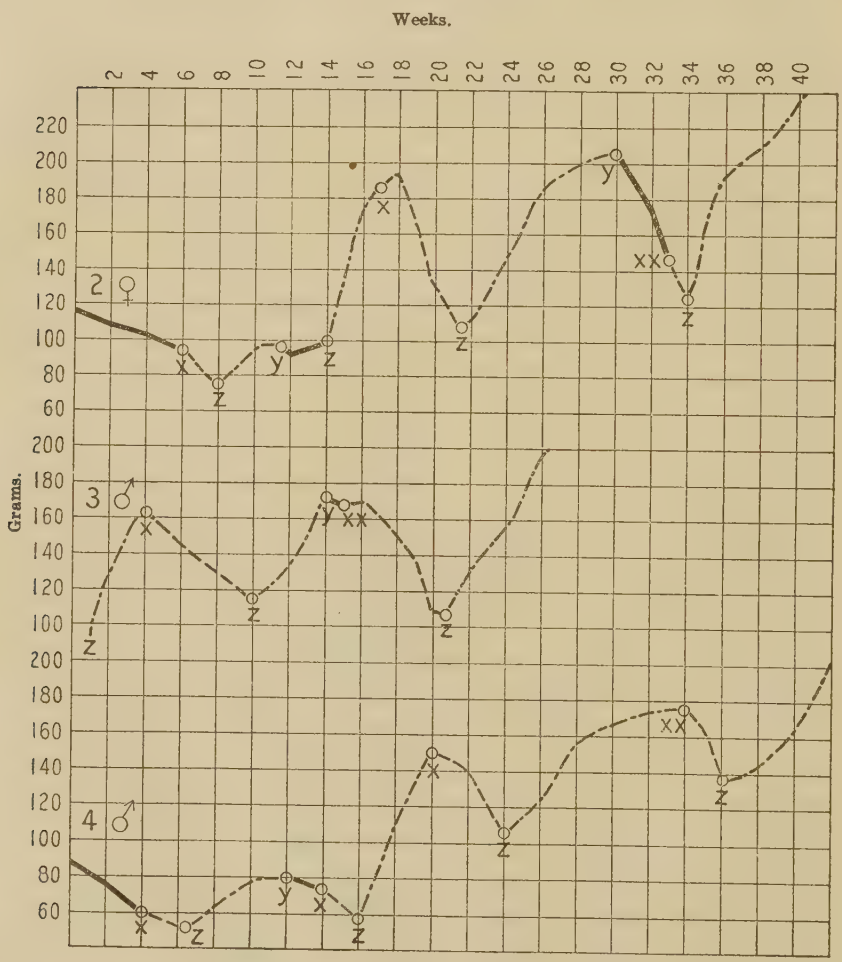

FIG. 1. Paco as source of vitamin B.

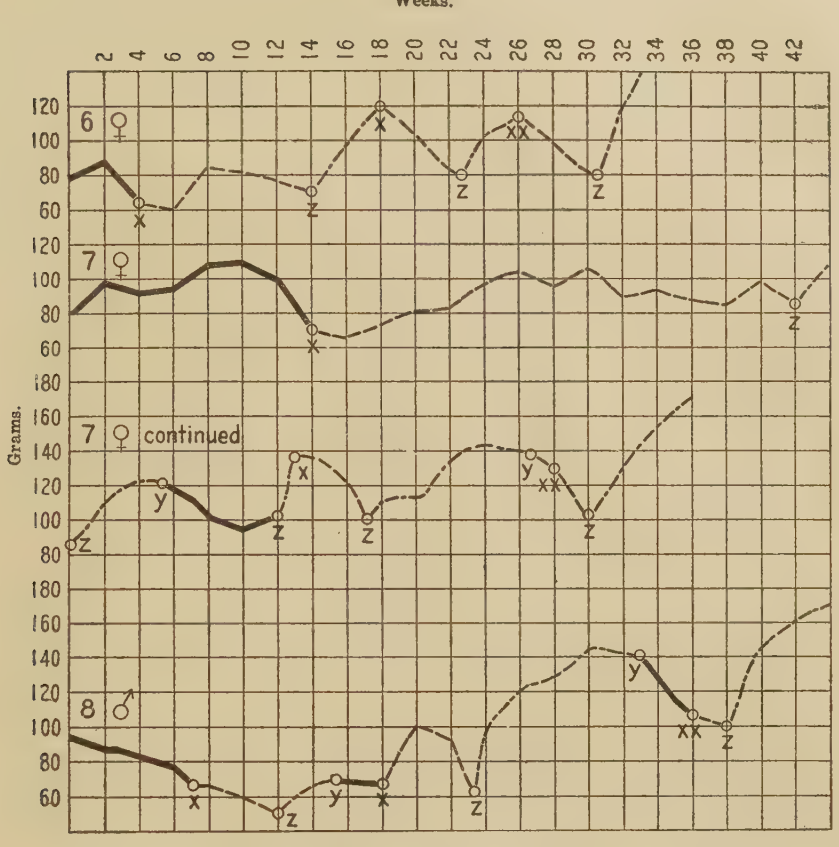

FIG. 2. Balunsay as source of vitamin B.

TABLE 3.—*Balunsay: Body weight and biweekly intake of basal ration.*

RAT 5 ♂.			RAT 5 ♂.		
Date.	Body weight.	Intake of basal ration.	Date.	Body weight.	Intake of basal ration.
1923	*Grams.*	*Grams.*	1924	*Grams.*	*Grams.*
July 21	96		January 5	86	62
August 4	109	101	January 19	79	57
August 18	106	90	February 2	73	55
August 31	111	96	February 16	81	49
September 15	123	89	March 1	97	80
September 29	129	104	March 15	95	79
October 13	116	81	March 29	88	83
October 27	x95	39	April 12	90	82
November 10	74	22	April 26	95	50
November 24	76	37	May 10	81	56
December 8	84	42	May 24	87	64
December 22	85	51	May 27	z68	

TABLE 3.—*Balunsay: Body weight and biweekly intake of basal ration*—Continued.

RAT 5 ♂.		
Date.	Body weight.	Intake of basal ration.
1924	*Grams.*	*Grams.*
June 7	108	93
June 17	y113	
June 21	105	80
July 5	92	62
July 12	x86	
July 19	73	63
July 21	[a]	

RAT 6 ♀.		
1924		
June 3	77	
June 17	88	66
July 1	x64	25
July 15	61	51
July 29	85	49
August 12	82	87
August 26	78	54
September 9	z70	61
September 23	97	107
October 7	x120	71
October 21	104	50
November 4	80	65
November 8	z80	
November 18	104	112
December 2	xx113	141
December 16	98	63
December 30	80	92
1925		
January 3	z80	
January 13	122	118
January 20	135	

RAT 7 ♀.		
1923		
July 21	80	
August 4	97	92
August 18	92	93
August 31	93	77
September 15	107	98
September 29	109	81
October 13	99	57
October 27	x70	34
November 10	65	34

RAT 7 ♀.		
Date.	Body weight.	Intake of basal ration.
1923	*Grams.*	*Grams.*
November 24	73	40
December 8	80	51
December 22	82	46
1924		
January 5	96	45
January 19	103	87
February 2	97	61
February 16	105	61
March 1	90	89
March 15	93	77
March 29	88	68
April 12	85	92
April 26	96	66
May 10	z86	57
May 24	110	108
June 7	122	90
June 17	y122	
June 21	120	82
July 5	104	36
July 19	94	65
August 2	z102	62
August 12	x137	
August 16	137	180
August 30	121	100
September 9	z100	
September 13	113	57
September 27	115	100
October 11	135	77
October 25	142	116
November 8	138	106
November 11	y137	
November 22	xx130	89
December 6	z103	113
December 20	132	103
1925		
January 3	155	157
January 17	170	133

RAT 8 ♂.		
1924		
March 15	96	
March 29	88	82
April 12	84	81
April 26	77	40

[a] Died.

TABLE 3.—*Balunsay: Body weight and biweekly intake of basal ration*—Continued.

RAT 8 ♂.			RAT 8 ♂.		
Date.	Body weight.	Intake of basal ration.	Date.	Body weight.	Intake of basal ration.
1924	*Grams.*	*Grams.*	1924	*Grams.*	*Grams.*
May 3	x68		September 27	128	91
May 10	65	41	October 11	143	93
May 24	60	49	October 25	141	97
June 7	z51	45	November 1	y142	
June 21	67	46	November 8	130	87
July 1	y70		November 22	xx108	58
July 5	69	39	December 6	z100	69
July 19	x68	53	December 20	144	56
August 2	100	43	1925		
August 16	90	61	January 3	161	146
August 26	z63		January 17	170	111
August 30	96	81	January 20	172	
September 13	122	59			

Uray babae.—When this supplement was added to the basal diet animals Nos. 9, 10, 11, and 12 continued to decrease in weight. Table 4 and fig. 3 show that the animals on this sup-

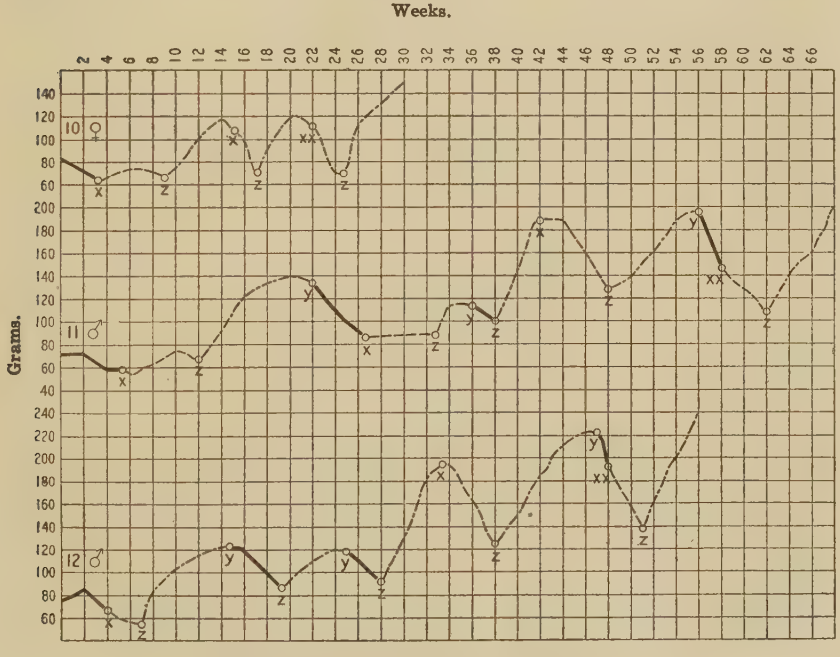

FIG. 3. Uray babae as source of vitamin B.

plement could not maintain their weights for any great length of time. They did not improve even with the administration of extract corresponding to 2 grams dry weight. The results of the color test also showed that uray is poor in vitamin B.

TABLE 4.—*Uray babae: Body weight and biweekly intake of basal ration.*

RAT 9 ♂.			RAT 10 ♀.		
Date.	Body weight.	Intake of basal ration.	Date.	Body weight.	Intake of basal ration.
1923	*Grams.*	*Grams.*	1924	*Grams.*	*Grams.*
July 18	y105		July 29	72	37
July 31	100	106	August 12	72	60
August 14	90	71	August 19	z66	
August 28	97	94	August 26	73	53
September 11	113	127	September 9	98	127
September 25	121	106	September 23	115	92
October 9	133	127	October 4	x109	
October 23	108	64	October 7	100	68
November 6	105	93	October 18	z72	
November 20	112	117	October 21	90	35
December 4	109	108	November 4	118	132
December 8	x109		November 18	xx111	106
December 18	105	82	December 2	69	111
December 22	z95		December 6	z69	
1924			December 16	110	105
January 1	136	140	December 31	130	136
January 15	164	163	1925		
January 29	150	111	January 13	150	102
February 12	167	124	January 20	152	201
February 22	177	163			
March 11	168	151	RAT 11 ♂.		
March 25	y173	143			
April 8	159	126	1923		
April 22	130	97	October 30	y72	
May 3	x108		November 13	72	65
May 6	z100	88	November 27	59	44
May 20	128	119	December 8	x59	
June 3	151	147	December 11	55	98
June 7	y151		December 25	64	42
June 17	126	55	1924		
July 1	109	60	January 8	73	60
July 8	80	28	January 22	z68	64
	(a)		February 5	91	80
			February 19	123	108
RAT 10 ♀.			March 4	132	108
			March 18	137	126
1924			April 1	y134	88
June 17	y83		April 15	111	66
July 1	72	63	April 29	90	53
July 12	x64		May 3	x86	
July 15	65	52			

[a] Died.

TABLE 4.—*Uray babae: Body weight and biweekly intake of basal ration*—Continued.

RAT 11 ♂.			RAT 12 ♂.		
Date.	Body weight.	Intake of basal ration.	Date.	Body weight.	Intake of basal ration.
1924	*Grams.*	*Grams.*	1924	*Grams.*	*Grams.*
May 13	86	71	February 16	86	93
May 27	87	64	March 1	103	74
May 31	z87	----	March 15	115	103
June 10	112	86	March 29	121	147
June 24	y113	78	April 5	y124	----
July 8	z100	61	April 12	118	111
July 22	143	120	April 26	100	38
August 5	x188	129	May 6	z86	----
August 19	188	117	May 10	94	51
September 2	161	78	May 24	111	111
September 16	z126	72	June 7	120	83
September 30	137	102	June 14	y118	----
October 14	160	121	June 21	110	50
October 28	187	127	July 5	z92	50
November 11	y196	136	July 19	131	116
November 25	xx145	56	August 2	183	125
December 9	130	63	August 12	x195	----
December 13	z109	----	August 16	196	110
December 23	142	135	August 30	163	82
1925			September 13	z125	53
January 6	160	148	September 28	148	106
January 20	201	130	October 11	186	102
RAT 12 ♂.			October 25	210	152
			November 8	221	118
			November 11	y224	----
			November 22	xx192	96
1923			December 6	157	46
December 22	y75	----	December 13	z137	----
1924			December 20	160	77
January 5	85	57	1925		
January 19	x67	58	January 3	200	133
February 2	58	53	January 17	243	143
February 9	z56	----	January 20	247	----

COLOR TEST

The method of Jendrassik (4) for qualitative test for vitamin B was followed. To the solution of the extracts used, a 2 per cent solution of acetic acid was added. The reagent, which consisted of equal volumes of tenth molar ferric chloride and potassium ferric cyanide solutions, was added to this solution of the extracts as long as the blue color increased. The test tubes containing the mixture were stoppered and allowed to

stand for ten minutes. One volume of distilled water was added and the color produced was observed.

The results of the color test were as follows:

Paco showed only a trace of blue color.
Balunsay showed some blue coloration.
Uray showed blue color but of a lighter shade than that produced by balunsay.
All the colors produced were less intense than were those produced by the corresponding amount of yeast extract.

CONCLUSIONS

Paco was found to be a poor source of vitamin B. Alcoholic extract corresponding to 2 grams of dried material, when added to a basal ration, was not enough to support the growth of rats.

Balunsay in the amount of 1 to 2 grams contains some vitamin B which could maintain the weight of the rats for some time.

Uray babae, like paco, contains a negligible amount of vitamin B. When an extract corresponding to 2 grams dry weight was used as supplement, the animals failed to grow.

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APPENDIX

DETAILED DESCRIPTION OF THE BEHAVIOR OF THE INDIVIDUAL RATS

Paco as source of vitamin B.—Rat 1 ♂, weighing 120 grams, was given the basal diet alone from July 18 to November 6, 1923, at which time the animal weighed 93 grams. From this time on 1 gram of the supplement was given daily. On December 4, 1923, this animal was observed to be weak and it died two days later.

Rat 2 ♀, on April 12, 1924, was placed on the basal diet until May 24, 1924, when its weight was only 93 grams. From this time on 1 gram of paco was given until June 7, 1924, when the animal showed signs of weakness and weighed only 72 grams. Then 1 cubic centimeter tikitiki was given daily. The tikitiki supply was exhausted on July 1, 1924, and so the animal was placed again on the basal diet alone until July 19. Then yeast was administered until August 9, 1924, when the animal attained a weight of 185 grams. From this date on 1 gram of paco was given until September 9, 1924, when the weight had decreased to 106 grams and signs of weakness were observed. Then 1 gram camote was given until November 8, 1924, when the weight of the rat was 206 grams. The animal was again placed on the basal ration alone. On November 29 the weight was found to be 147 grams only, and from this date paco extract corresponding to 2 grams dry weight was given in addition until December 6, 1924. In spite of the increase in supplement, this animal decreased in weight to 124 grams, so from this time it was given camote. On camote as supplement the rat increased in weight to 235 grams.

Rat 3 ♂ was first placed on the basal diet plus yeast beginning July 22, 1924. On this ration it increased from 93 to 163 grams in weight. One gram paco was substituted for the yeast until September 23, 1924, when the animal weighed 115 grams. From this date camote was given instead of paco until October 21, 1924, when the animal had attained a weight of 172 grams. The camote was cut off then, and the basal diet alone was given until November 1, 1924, when the weight had decreased to 169 grams. Then extract corresponding to 2 grams dry weight of paco was given in addition to the basal ration. In spite of the increase in supplement the animal decreased in weight; so 1 gram camote leaves was again given instead of the supplement in question, and the animal attained a weight of 203 grams.

Rat 4 ♂, with an initial weight of 88 grams, was placed on basal ration alone from March 22 until April 19, 1924, when the weight had decreased to 61 grams, and then 1 gram paco was given as supplement. This treatment was continued until May 6, 1924, when the weight was only 53 grams and signs of weakness were observed. Then 0.5 cubic centimeter tikitiki was given daily instead of paco until June 14, 1924, when this animal had attained a weight of 80 grams. As the supply of tikitiki was exhausted, the animal was placed on basal diet alone until June 28, 1924, when it weighed 74 grams. Then 1 gram paco was given again until July 12, 1924, and its weight continuously decreased to 57 grams and signs of weakness were again observed. From this time yeast was given instead of paco and the rat, on August 9, 1924, was found to weigh 150 grams. Paco was again given instead of yeast until September 6, 1924, when the weight had decreased to 106 grams. Then 1 gram camote

was given until November 15, 1924, when the weight had increased to 175 grams. Paco extract corresponding to 2 grams dry weight was given instead of camote until November 29, 1924, when the animal weighed only 137 grams and had weakened, as before. From this time camote was repeated until the rat attained a weight of 203 grams.

Balunsay as source of vitamin B.—Rat 5 ♂, with a weight of 96 grams, was given basal ration alone from July 21 until October 27, 1923, when the weight was 95 grams. Then 1 gram balunsay was given daily until May 27, 1924, when the weight had decreased to 68 grams and signs of weakness were marked. From this date 0.5 cubic centimeter tikitiki was given instead of balunsay until June 17, 1924, when the weight had increased to 113 grams. The supply of tikitiki having become exhausted, from this time only basal ration was given until July 12, 1924, when the rat had fallen in weight to 86 grams. Balunsay was then again added to its basal ration and on July 19, 1924, the animal was observed to be very weak and to weigh only 73 grams. Two days later it died.

Rat 6 ♀, weighing 77 grams, was placed on basal ration from June 3 to July 1, 1924, when its weight had decreased to 64 grams. From this time 1 gram balunsay was added to the basal diet until September 9, 1924, when the rat weighed only 70 grams and signs of weakness were observed. Then 1 gram camote was given instead of balunsay until October 7, 1924, when the rat weighed 120 grams. From this date the camote supplement was cut off and 1 gram balunsay was given daily, instead, until November 8, 1924, when the weight had decreased to 80 grams. Again 1 gram camote was given until December 2, 1924, when the body weight had increased to 113 grams. From this time camote was cut off and, instead, alcoholic extract of balunsay corresponding to 2 grams dry weight was administered until January 3, 1925, when the animal was observed to be very weak and to weigh only 80 grams. The camote was given again until full recovery was observed and the animal weighed 135 grams.

Rat 7 ♀, with an initial weight of 80 grams, was placed on basal ration alone from July 21 to October 27, 1923, when the weight had decreased to 70 grams. From this date 1 gram balunsay as supplement was added daily to the diet until May 10, 1924, when the body weight was 86 grams. At this time signs of weakness were observed and so tikitiki was given, instead, until June 17, 1924, when the weight had increased to 122 grams. Then, the supply of tikitiki being exhausted, basal diet alone was given until August 2, 1924, when the rat was found to be weak and to weigh 102 grams. Then one pill yeast was given daily until August 12, 1924, when a weight of 137 grams had been attained; then the yeast was discontinued and 1 gram balunsay was given until September 9, 1924, when this rat had decreased in weight to 100 grams and signs of weakness were evident. One gram camote as supplement was given, instead of balunsay, until November 11, 1924, when the weight had increased to 137 grams. Then the supply of camote was cut off, and on November 22, when the weight was 130 grams, balunsay extract corresponding to 2 grams dry weight was given. On December 6, 1924, the animal weighed only 103 grams and was very weak. From this date camote was given until the animal attained a weight of 170 grams.

Rat 8 ♂, on March 15, 1924, with a body weight of 96 grams, was placed on the basal ration until May 3, 1924, when the weight had decreased to

68 grams. From this time 1 gram balunsay was given daily until June 7, 1924, when it weighed only 51 grams and was hardly able to move. Tikitiki then was given as supplement instead of balunsay. The tikitiki supply, however, was exhausted by July 1, 1924, and only basal diet was given until July 19, when the weight had fallen to 68 grams. One gram balunsay was again administered until August 26, 1924, when the weight had further decreased to 63 grams and the animal was very weak. Camote was given from this time until November 1, 1924, when it had increased in weight to 142 grams. The camote supply was cut off and only basal ration was given until November 22, 1924, when the weight had again decreased to 108 grams. From this time balunsay extract corresponding to 2 grams dry weight was administered to the animal until December 6, 1924, when the body weight had further decreased to 100 grams. The animal showed signs of sluggish motion and in this condition camote was given. This treatment continued until a weight of 172 grams was attained by the rat.

Uray babae as source of vitamin B.—Rat 9 ♂, with an initial weight of 105 grams, was given basal ration alone until December 8, 1923, when the weight was 109 grams. From this time 1 gram uray was added to the ration daily until December 22, 1923, when signs of weakness were observed and its weight had decreased to 95 grams. Then tikitiki was given, instead, until March 25, 1924, when full recovery was observed and the animal had attained a weight of 173 grams. From this time tikitiki was cut off until May 3, 1924, when the weight had decreased to 108 grams, and then 1 gram uray was given again. Three days later the rat was observed to be sick and it weighed only 100 grams; so tikitiki was administered until June 7, 1924, when it had attained a weight of 151 grams. Tikitiki was cut off again and only basal ration was given until July 8, 1924, when the animal died.

Rat 10 ♀, with its initial weight of 83 grams, was placed on basal ration alone from June 17 to July 12, 1924, when its weight had decreased to 64 grams, and then 1 gram uray was added daily until August 19, 1924. On this date the rat was found to be weak, and it weighed only 66 grams; so 1 gram camote was given instead of the supplement uray. On October 4, 1924, the animal weighed 109 grams, and from this date 1 gram uray was given again instead of camote. By October 18 the animal had again become weak and its weight had decreased to 72 grams. Again camote was given until November 18, 1924, when its weight was 111 grams. Then uray extract, corresponding to 2 grams dry weight, was administered until the weight had decreased to 69 grams and signs of weakness were observed. Instead of the supplement uray, camote was given until the rat fully recovered and attained a weight of 152 grams.

Rat 11 ♂, with an initial weight of 72 grams, was given basal diet alone from October 30 to December 8, 1923, when the weight was only 59 grams. Then 1 gram uray was added to the basal ration until January 22, 1924, when the rat had a weight of 68 grams. Tikitiki was given instead of uray until April 1, 1924, when the rat had attained a weight of 134 grams. Only basal ration was then given and on May 3, 1924, the body weight was found to be 86 grams. Then 1 gram uray was administered until May 31, when the animal was observed to be weak and to weigh 87 grams. One cubic centimeter of tikitiki was given daily until

June 24, 1924, when the rat weighed 113 grams. On July 8, 1924, the animal weighed only 100 grams, and yeast (one pill daily) was given until August 5, 1924, when the weight had increased to 188 grams. One gram of uray was substituted for the yeast until September 16, 1924, when the rat had a weight of 126 grams and was in sluggish condition. Then camote was given until November 11, 1924, when a weight of 196 grams had been attained. This treatment was cut off, and on November 25 the weight had decreased to 145 grams. From this time uray extract corresponding to 2 grams dry weight was given, but in spite of this treatment the rat became weak and it decreased in weight to 109 grams by December 13, 1924. Then camote was given until the weight had increased to 201 grams.

Rat 12 ♂, with its initial weight of 75 grams, was placed on basal ration alone from December 22, 1923, until January 19, 1924, when its weight had decreased to 67 grams and the animal was very weak. Then 1 gram uray was given until February 9, 1924, when the weight had further decreased to 56 grams and the weakness had increased. Then tikitiki was substituted for uray until April 5, 1924, when the weight had increased to 124 grams. The tikitiki supply was then cut off until May 6, 1924, when the animal weighed 86 grams. At this time the animal appeared very weak and it was feared that it would die; so tikitiki was again given until the animal weighed 118 grams. Then basal ration alone was given until the animal had decreased to 92 grams. Then yeast was administered until the rat weighed 195 grams. Then again 1 gram uray was given in place of yeast until September 13, 1924, when the weight had decreased to 125 grams. From this time 1 gram camote was given until November 11, 1924, when a weight of 224 grams had been attained. Camote was again cut off, and eleven days later the weight was 192 grams. Uray extract equivalent to 2 grams dry weight was administered until December 13, 1924, when the weight had decreased to 137 grams and weakness was observed. Then camote was given in place of the extract until January 20, 1925, when the weight was 247 grams and full recovery was observed.

ILLUSTRATIONS

TEXT FIGURES

FILICES ALIQUOT NOVAE ORIENTALES

By Edwin Bingham Copeland

Of Chico, California

ONE PLATE

Cyathea Ramosii Copel. sp. nov.

Trunco 4 cm crasso, verisimiliter breve; stipite ca. 25 cm alto, deorsum ad lineas ventrali-laterales paleis stramineo-fuscis apices versus minutissime nigro-ciliatis 10–18 mm longis lanceolatis ornato alibi nudo, minute asperulo, rhachibusque fusco-atropurpureis; frondo ca. 1 m longa, fere 50 cm lata, praecipue deorsum valde attenuata, rhachi in furca ventrale sparse velutina, alibi pilis fulvis deciduis sparse vestita; pinnis infimis remotis sensim reductis usque vix 6 cm longis pinnatifidis, medialibus 25 cm longis, 7 cm latis, subhorizontalibus, haud proximis, sessilibus, acuminatis; pinnulis multis sed non contiguis, horizontalibus, sessilibus, vix 1 cm latis, obtusis vel subacutis, ½ ad costam pinnatifidis, costa atropurpurea inferne pilis pallidis sparsis et paleis parvis lanceolatis raris fulvis vestita; segmentis 2 mm latis, oblique truncatis, fere integris, papyraceo-chartaceis, inferne viridibus, superne paullo obscurioribus; venulis utroque latere ca. 4, fere omnibus simplicibus; soris medialibus, fuscis, nudis.

Leyte, Dagami, *Ramos Bur. Sci. No. 15271,* August, 1912.

This is on one hand unmistakably nearly related to *C. trichophora,* of Laguna Province, Luzon, from which it differs in its much darker color, rather less ample fronds and entire segments. On the other hand, it shows obvious affinity to the group of *C. glabra.*

Cyathea Zamboangana Copel. sp. nov.

Sp. C. suluensi Baker similis et quondam cum ista confusa; trunco 3–6 m alto, 5 cm crasso, nigro, nudo, aspero, cicatricibus ellipticis 5 cm longis 2.5 cm latis ornato, capite cum stipitibus 30 cm longis spinosis tomento griseo-fulvo dense vestitis; fronde ampla, ovata, abrupte acuminata, rhachi castanea, fulvo-furfuracea, sursum glabrescente et inermo; pinnis infimis 25 cm, sequentibus 40 cm longis, horizontalibus, stipitulatis, abrupte acu-

minatis, rhachibus paleis variis, cinereo-fulvis, plus minus ciliatis vestitis; pinnulis horizontalibus vel sursum patentibus, maximis 10 cm longis, 2 cm latis, elliptico-linearibus, acuminatis, basi plerisque obliquis et subcordatis, basin versus fere ad costam pinnatis; segmentis 5 mm latis, oblique truncato-cuspidatis, apices versus integris vel obscure denticulatis, alibi integris, papyraceo-chartaceis, inferne paullo pallidioribus; costa inferne cum paleis parvis cinereis sparsis polymorphis plerisque laciniatis, costulis squamulis cinereis plerisque bullatis valde apiculatis interdum ciliatis ornatis; venis utroque latere ca. 6, plerisque furcatis; soris medialibus, indusio fusco, persistente.

MINDANAO, mountains back of San Ramon, Zamboanga, alt. 500 meters, *Copeland No. 1646*, February, 1905.

This was identified as *Cyathea suluensis* Baker, and specimens were distributed under that name; but examination of a fragment of the type of that species shows that the pinnules are broadest at the base instead of above it; the segments dentate near the apex, but not drawn to a sharp point; the costa clothed only with a sparse and minute scurf; and the veins (costules) with brown, strongly bullate, but not long-pointed scales.

Dennstaedtia Shawii Copel. sp. nov.

Stipite alto rhachique glabris, inermibus, castaneis, vix nitidis; fronde 45 cm alta, oblonga; pinnis pluriparibus, inferioribus aequalibus, oppositis, fere sessilibus, 15–20 cm longis, 6 cm latis, acuminatis, infimis ad basin abrupte angustatis; pinnulis[i] subsessilibus, deltoideo-lanceolatis, acutis vel subacuminatis, 12–15 mm latis, pinnulis[ii] oblique trapeziformibus, breviter alato-stipitulatis, maximis 6–8 mm longis, 5–7 mm latis, incisis, glabris, subcoriaceis; soris parvis, in sinubus.

PAPUA, mountains behind Taupota, leg. Rev. P. C. Shaw, *King No. 491*.

Like *D. cuneata* in the small, broad ultimate pinnules, and intermediate in character between this group and that of *D. ampla*, suggesting the latter group by its naked, dark, somewhat shiny axes and the texture and brownish green color of the foliage.

Humata parvula (Wall.) Mett.

PAPUA, mountains behind Taupota, leg. Rev. P. C. Shaw, *King No. 495*.

In Malaya, but apparently new to New Guinea.

Davallia Robinsonii Copel. sp. nov.

D. solidae affinis, textura tenuiore et soris longioribus plerisque solitariis distinguenda; rhizomate 6 mm crasso, lignoso,

glauco, paleis nigris fusco-marginatis lineari-lanceolatis apices versus ciliatis persistentibus dense obtecto; stipite 15–20 cm alto, fulvo-fusco, frondeque glabris; fronde ca. 30 cm alta, late deltoidea quadripinnatifida; pinnulis ultimis subcoriaceis, inferioribus ovatis acutis, superioribus lanceolatis acuminatis, basi cuneatis integris, alibi valde incisis, venis spuriis carentibus; soris inferioribus medio ad baseos interfissis, superioribus pluris omnino separatis et ad dentes angustos solitariis, 2 mm longis, 0.6 latis utrinque anguste alatis; indusio apice truncato, cum lamina conterminante.

MINDANAO, prope Cotabato, ad arbores, leg. C. B. Robinson, *Bur. Sci. No. 11704.*

This approaches *D. mauritiana* Hook. in appearance. *Davallia solida* has quite uniformly longer sori in Mindanao than elsewhere, thus approaching the extreme represented by the species just described.

Saccoloma caudatum Copel. sp. nov.

Rhizomate, teste King, longo, crasso, nigro; fronde grande, glabra, laete viride, herbacea, quinquepinnatifida, rhachi straminea; pinna unica visa ultra 40 cm longa, 20 cm lata, obliqua; pinnulis[I] inferioribus 5 cm latis, in caudas inciso-serratas usque ad 4 cm longas extensis, stipitulatis, basi obliquis; pinnulis[II] deltoideo-lanceolatis, infimis acuminatis, aliis acutis, majoribus ad alas angustas pinnatis; pinnulis[III] infimis acroscopicis ultra 1 cm longis, 3-4 mm latis, profunde pinnatisectis, acutis, basi obliquis, segmentis majoribus cuneatis; soro in segmento quoque uno, in segmentis maximis laterale, in aliis plerumque infra-apicale, subimmerso, indusio cuneato, margine libero rotundato vel crenato, apicem segmenti interdum superante.

PAPUA, Hydrographers Range, alt. 900 meters, *King No. 462.*

Rather like a *Dennstaedtia* in appearance, but with the indusium of *S. moluccanum,* from which it differs in being larger, more cut, and thinner, aside from the remarkably caudate pinnules. The inclusion of these two species in *Saccoloma* might be criticized.

Pteris Warburgii Christ (*Pt. Finisterrae* Rosenstock).

PAPUA, watershed overlooking Mullin's Harbour, alt. 3,000 to 4,000 feet, *King No. 474.*

This specimen is unlike the descriptions in being merely pinnatifid, with the lowest segments connected with the following by a broad wing, as well as adnate on the lower side, indicating perhaps that it is a juvenile or underdeveloped individual. More

ample collections will eventually show whether or not the merely pinnatifid plant is distinct. Except in venation, the sterile frond resembles *Blechnum Patersoni* to a surprising extent. The fertile frond is much contracted. The fertile margin is very "deep," at a right angle to the plane of the frond, as in *Schizostege*. The rhizome is very stout, and suberect. The identification of *Pt. Finisterrae* with *Pt. Warburgii* is on the authority of Rosenstock.

Tectaria minuta Copel. sp. nov.

Caudice parvo, suberecto, paleis castaneis lanceolatis attenuatis integris usque ad 3 mm longis vestito; stipitibus confertis, 2–4.5 cm altis, gracilibus, atris, baseos versus sparse paleatis, alibi minute velutinis, sursum costisque glabrescentibus; frondibus simplicibus, ovatis, cordatis, apice rotundatis, late crenatis vel maximis sublobato-crenatis, papyraceis, glabris, inferne pallidis, 3–4 cm longis, 23–27 mm latis; venis vix conspicuis nec ad marginem attingentibus, venulis reticulationem laxam cum liberis paucis inclusis efficientibus; soris sparsis; indusio rotundato-reniforme, persistente.

PAPUA, mountains behind Taupota, leg. Rev. P. C. Shaw, *King No. 493*.

As is usually true of such dwarfs, it may be suspected that this fern may reach a greater size, and then differ considerably in appearance. However, the specimens sent are quite uniform and bear numerous fruiting fronds.

Tectaria (Arcypteris) diversisora Copel. sp. nov.

Caudice erecto, 1 cm crasso, apice paleis minutis vestito; stipitibus confertis, 35–40 cm altis, atropurpureis vel deorsum nigrescentibus, nitidis, deorsum paleis paucis angustis deciduis castaneis ornatis, aliter glabris; fronde normale profunde tripartita, 14–20 cm longa, 10–17 cm lata, late cordata, subcoriacea, glabra, inferne pallida; segmentis acuminatis, mediale majore oblongo-lanceolato, 4–7 cm lato, integro, lateralibus obliquis; costis validis, atrocastaneus; venis primariis remotis, fere ad marginem protensis, venulis obscuris; soris irregularibus, plerisque oblongis, linearibus et orbicularibus interspersis, nudis.

PAPUA, Hydrographers Range, *King No. 470*.

The fertile fronds are somewhat narrower and longer-stalked than the sterile. Considering the texture, the parenchyma of dried plants is notably translucent, making the venation conspicuous by transmitted light. The parenthetic name, *Arcypteris*, is used in a purely descriptive sense; the nearer affinity of

this species is not to *T. irregularis,* but to the group of *T. platanifolia, T. Labrusca,* etc., an easily recognized and natural group, with various indusia or none at all.

Genus **TECTARIDIUM** Copel. novum

Genus ex Tectaria evolutum, frondibus biformibus, sterilibus simplicibus venatione sagenioidea, fertilibus aut pinnatis aut cum costa anguste alata, pinnis angustis late distantibus, cum lamina usque ad substratum sororum contracta; indusiis grandibus, persistentibus.

Tectaridium MacLeanii Copel. sp. nov. Plate 1.

Rhizomate erecto, 8 mm crasso, paleis linearibus rubido-castaneis dense vestito; stipitibus atropurpureis, paleis linearibus rubido-castaneis plus minus persistentibus vestitis, frondium sterilium 5–10 cm, fr. fertilium 20–35 cm altis; fronde sterile lineari-elliptica, 35–45 mm lata, 15–20 cm alta, acuta, basi cordata vel subcordata, integra, herbacea, glabra, olivacea, costa deorsum atropurpurea, sursum pallescente; venis primariis inconspicuis, fere ad marginem attingentibus, venulis reticulationem laxam efficientibus venulis inclusis simplicibus vel hamatis; fronde fertile 20–35 cm alta, caudata; pinnis utroque latere 15–35, infimis remotis paullo abbreviatis, medialibus 25–30 mm longis, horizontalibus, nunc pinnatis nunc rhachillis anguste alatis; pinnulis vel segmentis suborbicularibus, in alam rhachillae decurrentibus, lamina soro solitario obtecta, soris ad pinnam medialem quamque 5–8 paribus, plerisque oppositis; indusio orbiculare, fere 2 mm lato, cum segmento vel pinnula fere conterminante, rarius peltato, saepius lineam secus medialem de puncto centrale usque ad marginem basalem affixo, persistente.

LUZON, Laguna Province, northeast of Paete, on well-drained hillside near Pabuntoc River, alt. 260 meters, coll. by Dr. F. T. McLean, March, 1917.

Tectaridium primitivum Copel. sp. nov.

Rhizomate valido, erecto vel adscendente; stipitibus confertis, frondis sterilis 5–15 cm altis, atropurpureis nitidis, paleis squarrosis castaneis lineari-lanceolatis vestitis, frondis fertilis duplo vel triplo longioribus; fronde sterile anguste lanceolata, ca. 25 cm alta, 4.5 cm lata, acuta, basi truncata vel late cuneata, integra vel late crenata, glabra, coriacea, costa inferne carinata; venis primariis obliquis, marginem fere attingentibus, venis aliis immersis, irregularibus, anastomosantibus cum venulis furcatis inclusis multis; fronde fertile 25 cm alta 5 cm lata, usque ad

alam angustam costae pinnatifida, segmentis 1 cm distantibus vel deorsum remotioribus, horizontalibus, medialibus 2–2.5 cm longis, ca. 2 cm latis; soris utroque latere costulae uniseriatis, magnis, superficialibus, mox contiguis; indusio orbiculare-reniforme, persistente.

LEYTE, Jaro, alt. 500 meters in silva, leg. *Wenzel No. 876.*

Of these two plants, Wenzel's came first into my hands and, with misgivings, it was diagnosed as a *Tectaria,* "altogether distinct from any other known species." Before I was ready to publish this, McLean's plant was brought in, with still more complete elimination of the lamina of the fertile frond.

Tectaridium is certainly a descendant of *Tectaria,* and is therefore correctly named (on suggestion by Mr. Maxon. It may be noted that *Pteridium* is not an appropriate name, as this fern is nearer to any common ancestor than is *Pteris.*) It is unlike the other ferns with very dimorphous fronds—*Hemigramma* and various ferns commonly bunched in *Leptochilus* and *Stenosemia*—in retaining conspicuous indusia. *Tectaria decurrens* rarely has fertile simple fronds, and may represent the place of origin of *Tectaridium* in the parent genus.

Asplenium Shawii Copel. sp. nov.

Stipite ultra 20 cm alto, rhachibusque atris et glabris; fronde ca. 35 cm alta, ovata, tripinnata, membranacea, atroviride; pinnis infimis paullo reductis, sequentibus ca. 16 cm longis, 7 cm latis, acuminatis; pinnulis [i] pedicellatis, acutis, 1 cm latis basi fere aequilateralibus; pinnulis [ii] pedicellatis, late oblongis, obtusis vel truncatis, basi oblique late cuneatis, majoribus ultra mediam incisis, lobis integris vel sparse dentatis; venis in pinnula quaque plerumque pinnatis, apicibus haud incrassatis; soris brevibus, indusiis castaneis, apud insertiones nigrescentibus.

PAPUA, mountains behind Taupota, leg. Rev. P. C. Shaw, *King No. 494.*

Darker and more lax than *A. laserpitiifolium.* Distinguished within its group by the equal-sided primary pinnules, small, broad ultimate pinnules, and dark color. There is no sign of proliferation, and the texture is such that none is to be expected.

Asplenium Goadbyi Copel. et Watts sp. nov.

Rhizomate ignoto; stipite ultra 10 cm alto, atrogriseo, glabrescente; fronde 25–30 cm alta, 7–10 cm lata, lanceolata, acuta, deorsum paullo vel non angustata, rhachi paleis parvis profunde fissis castaneis vestita; pinnis ca. 16-paribus, brevipedicellatis, usque ad 7 cm longis et 2 cm latis, oblique deltoideo-lanceolatis,

acutis vel acuminatis, praecipue apices versus serratis, basi inferiore cuneata superiore truncata interdum subauriculata semper valde dilatata, chartaceis, pallidis, superne sparsiter inferne densius paleis minutis plus minus ad basin fissis castaneis vestitis; soris linearibus, usque ad 16 mm longis, ad marginem et costam fere attingentibus, basalibus longioribus curvatis, indusio pallido-marginato.

NEW BRITAIN, Herbartshoe, leg. *Lt. Goadby No. 1.* The associate author is the Rev. W. W. Watts.

This has the general appearance of a member of the group of *A. falcatum,* but the pubescence is very different. The paleæ are one- to five-branched, rarely still more dissected, with or without some paler cells between the axes at the base. Similar branched hairs or scales are found on *A. pellucidum* Lam., *A. horridum* Kaulf., and, especially developed, on *A. paleaceum* R. Br.; a suggestion of the same structure is found on *A. caudatum* Forst. and *A. diversifolium* Bl.

Loxogramme spatulata Copel. sp. nov.

Rhizomate filiforme, 0.5–0.8 mm crasso, paleis 1–2.5 mm longis acuminatis basibus insigniter dilatatis ad et apud pseudopodia persistentibus, alibi caducis; frondibus remotis, usque ad 12 cm longis et 12 mm latis sed plerisque minoribus, 1–1.5 cm infra apicem latissimis, cuspidato-acuminatis, lamina deorsum ad alam angustam usque ad articulationem inconspicuam protensam angustata, margine angustissime cartilaginea, costa superne praestantiore, infra apicem immersa; soris immersis, ad partem dilatatam frondis restrictis, obliquis, utroque latera 4–7, tum demum confluentibus.

CHINA, Hupeh, S. Wushan, on rocks, *E. H. Wilson No. 620.* Type in the Hongkong Herbarium.

A species of the group of *L. malayana,* notable for its small size and the extreme development of the tendency, shown by the fronds of almost the whole genus, to become broader above the middle.

ILLUSTRATION

PLATE 1. TECTARIDIUM MACLEANII G. AND SP. NOV.

NOTES ON HEALTHY CARRIERS OF DYSENTERY BACILLI

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During an epidemic of bacillary dysentery healthy dysentery carriers are frequently found in rather great numbers among persons who come in contact with dysentery patients. Our experience in that respect confirms the findings of many authors, as reported in the literature. There are few reports on dysentery carriers among healthy persons during the period when bacillary dysentery is not prevalent. While we were investigating carriers of pathogenic intestinal bacilli a few years ago, we had opportunity to find so-called healthy carriers of dysentery bacilli during a time when bacillary dysentery was not prevalent. Thus we obtained some results which are described in this paper.

THE PROCEDURE OF INVESTIGATION, THE SOURCE OF MATERIAL, AND THE NUMBER OF CARRIERS FOUND

As soon as a large number of recruits entered the Imperial Guards Regiments (infantry and cavalry) in Tokyo in January, 1924, they were subjected to a bacteriological examination for the purpose of determining whether or not they were bacillus carriers. Their stools were sent to our laboratory, and the routine stool examination was made twice on each individual. Two thousand eight hundred forty-seven men were examined. From these we isolated dysentery bacilli in fifteen (0.52 per cent). As to the type of dysentery bacillus, we found "Y" (Hiss-Russell) type in eight cases, Flexner in six, and nonfermenter of mannite in only one case. These men, in both infantry and cavalry regiments, were recruited from various parts of Japan where bacillary dysentery was not prevalent at that time.

In addition to these dysentery carriers one case of typhoid carrier and one case of paratyphoid A carrier were detected.

Furthermore, four thousand six hundred forty-eight trained soldiers belonging to various units of our Imperial Guards Division were examined for the purpose of determining whether or not they were bacillus carriers in the period from March to December, 1924. During this time some cases of bacillary dysentery occurred sporadically. Fifteen men (0.32 per cent) among the four thousand six hundred forty-eight were discovered as harboring dysentery bacilli. From these fifteen cases we isolated "Y" (Hiss-Russell) bacillus in nine cases, Flexner in four, mannite nonfermenter in one, and Shiga bacillus in only one case. As a general rule, the stool examination was made twice. Some soldiers, however, were examined only once on account of their special condition of service. Others were examined more than twice.

Furthermore, we examined bacteriologically five hundred ninety-eight men who belonged to the Reserve Corps and were reënlisted for the training service for a short time in April and May, 1924. Only one case among these five hundred ninety-eight was noted as excreting dysentery bacillus ("Y" type). In January, 1925, one thousand four hundred sixty-five men of the First Regiment of the First Division in Tokyo were examined once for pathogenic intestinal bacilli. Of these, four were found to harbor dysentery bacillus. From these four carriers we isolated Flexner bacillus in three cases and "Y" in one. In these cases the stool examination was made only once. According to this investigation, even at the time when bacillary dysentery was not prevalent there were found about 0.52 per cent of army recruits (all young men about 20 years old) who excreted dysentery bacilli. About 0.32 per cent of trained soldiers living in the barracks were also harboring the pathogenic germ of dysentery. These bacillus carriers were all in perfectly good health and gave no history of ever having had dysentery, so far as could be ascertained. Moreover, the appearance of the stools was noted as normal. None of them had had dysentery during the period when they were isolated.

TYPES OF DYSENTERY BACILLI ISOLATED FROM HEALTHY CARRIERS

Thirty-one strains were isolated from the bacillus carriers. These strains were carefully and thoroughly identified. The majority of them belonged to the acid types; that is, the "Y"

(Hiss-Russell) and the Flexner types. The typical Shiga bacillus was found in only one case.

The classification of the types of *B. dysenteriæ* was, therefore, as follows:

Type.	Cases.
"Y" (Hiss-Russell)	18
Flexner	10
Shiga	1
Nonfermenter of mannite	2
Total	31

The strains of nonfermenters of mannite belonged to a type which ferments maltose and dextrin but does not affect mannite. Recently I. Tanaka studied these strains under the direction of one of us (Saisawa) and published the results of his work in the Scientific Reports from the Government Institute for Infectious Diseases, Tokyo, 1925. Both morphologically and biologically all of the isolated strains were identified, and they corresponded to the standard types. Some strains of "Y" and Flexner type were used for animal experiments soon after isolation from the carriers. They were all pathogenic for mice and guinea pigs and showed a fairly high degree of virulence. Blood specimens were taken from some of the carriers for immunological tests. The sera of the carriers agglutinated the strains isolated from them as well as the corresponding laboratory strains, the titer varying from 1 : 40 to 1 : 160.

DURATION OF THE STATE OF DYSENTERY CARRIER AND THE NUMBERS OF DYSENTERY BACILLI EXCRETED IN THE STOOLS OF HEALTHY CARRIERS

Eighteen bacillus carriers were selected, to enable us to observe for how long and in how large numbers the pathogenic microörganism was discharged in their fæces. The stools of the carriers were examined two or three times a week by the customary bacteriological methods. The sigmoidoscopic method was also applied for ascertaining the condition of the rectum and sigmoid whenever possible. This method enabled us to secure specimens directly from the inflamed area itself and will be described later on. Our observation continued as long as the carrier state persisted. Table 1 shows the results. As will be seen from Table 1 the majority of the carriers continued to excrete the pathogenic microörganism in question in their stools for a long time after it was first detected by us as such. The

TABLE 1.—*Showing the duration of the carrier state in bacillary dysentery.*

[+, positive culture; —, negative culture; R, recto-sigmoidoscopic examination.]

No.	Name of healthy dysentery carrier.	Type of dysentery bacillus.	Date of first examination.	1st week.	2d week.	3d week.	4th week.	5th week.	6th week.	7th week.	8th week.
			1924								
1	U. Aisawa	Y	Mar. 11, +	—+	—++	+++	++	—+	R —+	——	——
2	T. Ota	Y	Mar. 16, +	———	+——	+——	+——	R +++	+—	+—	——
3	E. Kuroda	Y	Apr. 14, +	+++	R +++	++—	—++	———	+——	+++	————
4	K. Sekiguchi	Y	Mar. 14, +	—	—+——	——+	+——	—	————	+—	R —+—
5	S. Shinohara	Y	Apr. 1, +	—+	——	————	——+	R —+—	——	——	——
6	N. Saito	Y	Apr. 11, +	———	++—	+—	R ——	—+	———	———	—+—
7	M. Fukuda	Y	Apr. 9, +	+——	+	++	R ——+	———	———	——	——
8	I. Yoshida	Y	May 9, +	———	R +——	—+	———	———	———	—	
9	T. Fukuda	Y	May 23, +	R +—	——	———	———	—			
10	E. Sugaya	Y	May 25, +	R +—+	+——	———	———	——			
11	T. Miyao	Y	Apr. 9, +	+—	————	——	———	—+—	———	R ———	——
12	M. Miyaji	Nonfermenter of mannite.	June 6, +	R +——	———	———	—				
13	Y. Ida	Y	Oct. 13, +	——+	——	R ——	——+	———	———	———	—
			1925								
14	S. Yahagi	Flexner	Jan. 26, +	+——	—	——	R R +++—	—	———	———+	———

No.	Name of healthy dysentery carrier.	Type of dysentery bacillus.	Date of first examination.	9th week.	10th week.	11th week.	12th week.	13th week.	14th week.	15th week.	16th week.	17th week.
			1924									
1	U. Aisawa	Y	Mar. 11, +	———	————	———						
2	T. Ota	Y	Mar. 16, +	———	—+	———	———	——+	———	—	—	——
3	E. Kuroda	Y	Apr. 14, +	———	——	—						
4	K. Sekiguchi	Y	Mar. 14, +	——+	————	—++	———	———	———	—		
5	S. Shinohara	Y	Apr. 1, +	———								
6	N. Saito	Y	Apr. 11, +	———	——							
7	M. Fukuda	Y	Apr. 9, +									
8	I. Yoshida	Y	May 9, +									
9	T. Fukuda	Y	May 23, +									
10	E. Sugaya	Y	May 25, +									
11	T. Miyao	Y	Apr. 9, +	—								
12	M. Miyaji	Nonfermenter of mannite.	June 6, +									
13	Y. Ida	Y	Oct. 13, +									
			1925									
14	S. Yahagi	Flexner	Jan. 26, +	————	————	—	—					
15	T. Enomoto	do	Feb. 26, +									
16	S. Ito	do	Jan. 22, +	———	——	———	——	——				
17	K. Hasunuma	do	Feb. 24, +									
18	K. Omori	Y	Feb. 25, +									

longest period of duration of the carrier state was thirteen weeks. A review of Table 1 shows the length of time during which *B. dysenteriæ* was found in the stools of our carriers.

Carriers.	Stool cultures became negative within—
4	1 week.
1	2 weeks.
6	3 to 5 weeks.
7	6 to 13 weeks.
Total 18	

The excretion of the bacilli was very irregular and intermittent. Continual excretion was seldom observed. In the majority of cases periods of positive cultures were followed by periods of negative cultures for a varying length of time. In some instances, after repeated stool examinations had been negative for as long as four weeks, the persistent examinations suddenly gave positive findings. From four to eight routine examinations were made during this time, as can be seen from Table 1 (Nos. 2, 4, 6, and 13). Carrier 11 suddenly showed a positive dysentery culture after negative cultures had been obtained eleven times. In the beginning the negative or free periods were relatively short. They gradually became longer and longer until the pathogenic bacillus could no longer be recovered from the stools.

The respective dysentery bacilli were present in varying amount. Most of the carriers excreted them in small numbers. In some cases, however, dysentery bacilli were found in enormous numbers, and sometimes in almost pure culture.

It has been hitherto believed that healthy dysentery carriers excrete a pathogenic microörganism for a brief period of time, and that they may be temporary carriers of short duration. We have had similar experience when the bacteriological examinations were made on contact carriers during an epidemic of bacillary dysentery. At that time the stool examinations were made by the usual methods and were repeated on three or four successive days only. The sigmoidoscopic method was not applied for this purpose at that time. Our recent investigation, however, as already stated, showed that some of the so-called healthy dysentery carriers harbored the pathogenic bacillus for a fairly long time. They were not temporary carriers, but rather chronic ones.

THE SIGMOIDOSCOPIC METHOD AND ITS APPLICATION TO THE BACTERIOLOGICAL EXAMINATION

Many authors have already shown that the application of the sigmoidoscope is an especially useful method in chronic cases of dysentery, and that it should be applied for the purpose of diagnosis and treatment as well. So far as we know, nobody has employed this useful apparatus for the examination of healthy bacillus carriers.

The sigmoidoscope used by us was that devised by H. Strauss. The mucous membrane of the rectum and sigmoid was carefully examined. If any lesion was found, specimens were taken from the lesion itself and examined for dysentery bacillus. The results thus obtained will now be described.

On the evening previous to examination for carriers a small dose of aperient saline was given to the soldiers. The next morning a plain water enema (0.5 to 1 liter) was given one or two hours previous to the examination proper. The instruments that come in contact with the lesion should be sterilized by boiling, and the application of any chemical disinfectants which might kill the dysentery bacilli should be avoided.

CLINICAL FINDINGS IN HEALTHY DYSENTERY CARRIERS SECURED BY THE SIGMOIDOSCOPE

As Table 2 shows, certain lesions were observed on the mucous membrane of the rectum and sigmoid flexure in a majority of the carriers. In some cases there was noted a very small lesion, or in a few cases the mucous membrane had an entirely normal appearance, so far as the sigmoidoscope showed. The principal lesions observed consisted of ulceration, formation of pseudomembrane, inflammation of solitary follicles, and production of mucus and granulation tissue.

Ulceration of the mucous membrane was one of the most important findings. It was noted in nine cases out of the eighteen. In most of the cases one or several ulcers were found on the back wall of the lower part of the sigmoid flexure, about 12 to 15 centimeters deep from the anus. The location of the ulcers varied somewhat. In some cases they were observed at the entrance of the sigmoid or in the ampulla. They were superficial, round ulcers with irregular edges, lenticular in shape, about 0.5 to 1 centimeter in diameter. The edge was prominent and undermined in some instances. The ulcers were

TABLE 2.—*Showing the lesions in the rectum and sigmoid flexure observed by the aid of the sigmoidoscope, their topography, and the results by cultures made from the inflamed area itself.*

[—, negative; +, few colonies; + +, fairly numerous colonies; + + +, numerous colonies.]

No.	Name of healthy dysentery carrier.	Date of examination.	Lesions in rectum and sigmoid flexure.				Cultures from—	
			Ulcers.			Other lesions, distance from anus.	Ulcers.	Mucus, pseudomembrane.
			Distance from anus.	Number.	Outline, shape (size).			
		1924	*cm.*					
1	U. Aisawa	Apr. 21	13–14	2	Elliptical (1 cm in diameter) irregular, rounded, ca. 1 cm in diameter.	Area around the ulcers and the rectal canal downward showed catarrhal inflammation.	+	
2	T. Ota	Apr. 26	13.5		Rounded oval, size of a pea		++++[a]	
3	E. Kuroda	Apr. 26	9		do	Scar at 14 cm. The surrounding intestinal canal was a little constricted.	+	
4	K. Sekiguchi	May 7				A large quantity of mucus at 25 cm		+
5	S. Shinohara	May 7	8	1	Rounded oval, size of a pea, lenticular ca. 0.5 cm in diameter.	A large pseudomembrane formed at 10 cm	++	+++
			14.5	2				
6	N. Saito	May 7				Scar at 16 cm, two scars at 20 cm	—	
7	M. Fukuda	May 10				Many small scars at 7 to 11 cm	—	
8	I. Yoshida	May 21	7	1	Rounded oval, size of a pea	A large pseudomembrane formed at 9 to 11 cm.	+	+
9	T. Fukuda	May 30				Mucosa was generally inflamed without any ulceration.		—
10	E. Sugaya	May 30	14–15	4	Very small		—	
11	T. Miyao	May 30				Scar at 6 cm, a large pseudomembrane at 5 to 7 cm.		—
12	M. Miyaji	June 10	12	1	Rounded oval, size of a pea	Intestinal canal was bent at 14 cm. The upper part could not be reached.	+++	
13	Y. Ida	Nov. 8				A scar at 17 cm	—	

		1925						
14	S. Yahagi	Feb. 20	13	1	Rounded oval, size of a pea	A large quantity of mucus	+	+
		Feb. 23	18	1	do.	A large quantity of mucus. Ulcers bled easily.	+	+
		Mar. 14	18			Ulcer at 13 cm was no longer found	+	++
15	T. Enomoto	Mar. 3	12	1	Elliptical, ca. 0.5 cm in long diameter.		+	
					Erosion		+	
16	S. Ito	Feb. 20				Mucus at 5 to 25 cm	+	+
		Mar. 3				Pseudomembrane formed at 25 cm, which was stripped off with difficulty. It bled easily from the mucous membrane. Mucus at 5 to 16 cm. (Sigmoiditis follicularis).	+	+
		Mar. 14				Thick mucus obscured the view at 12 to 19 cm.		
		Mar. 23				It was wiped off and then lymphatic follicles were seen. They were swollen and hypertrophied, with hyperæmic or easily bleeding point at their center (Sigmoiditis follicularis), mucous membrane having a velvety appearance.		—
17	K. Hasunuma	Mar. 3	14	1	Rounded, 0.5 cm in diameter	Ulcers bled easily	—	
		Mar. 14	16	1	Rounded oval, size of a pea		—	
18	K. Omori	Mar. 3				A large quantity of mucus obscured the view.		+
		Mar. 14						—

[a] In pure culture.

sometimes obscured, being covered by mucus or pseudomembrane which could be wiped off with some difficulty. In other instances the pseudomembrane consisted of a large rag, which was easily stripped off.

At the same time, catarrhal inflammation of the intestinal wall was observed around the ulceration. The mucous membrane of the inflamed area was hyperæmic and swollen, in appearance very much like velvet. The solitary lymphatic follicles of the intestine were often swollen and hypertrophic to some extent. Each inflamed follicle had a minute hyperæmic or easily bleeding point at its center. A large mass of mucus was occasionally found here and there. It was rather common to find evidence of inflammation in a scarred fibrous intestine. The granulation tissue with surrounding hyperæmia had a characteristic appearance.

In some instances no ulceration was noted anywhere, but the anal canal was full of a greenish gray mass of mucus.

BACTERIOLOGICAL EXAMINATION OF LESIONS DISCLOSED BY THE SIGMOIDOSCOPE

If an inflamed area, a patch of ulceration, a pseudomembrane, or mucus was observed with the aid of the sigmoidoscope, cultures were taken from these lesions. The area was swabbed by means of a sterile cotton plug which was moistened a little with peptone water. The material thus taken was at once spread out upon the surface of Endo plates. The results of the culture examinations are shown in Table 2.

When material was taken directly from the ulcers it was not uncommon to secure almost pure cultures of dysentery bacillus, though the colonies were few in number. *Bacillus coli* and other saprophytic nonpathogenic germs met with in the stool culture were found in very small numbers. Rarely we met with numerous colonies of dysentery bacilli. In spite of the fact that some cultures were taken directly from the ulcer, the incubated Endo plates yielded no colony of dysentery bacillus. This happened in the case of carriers 10 and 17 (Table 2). From the scarred area dysentery bacillus was never isolated. The pseudomembrane and the mucus usually contained the germ in varying numbers. When, after careful examination of the mucous membrane of the intestinal wall, from the anal canal up to the sigmoid flexure, a lesion was not noted, cultures were taken from the mucus found in the upper part of the sigmoid, especially near the vertex flexuræ sigmoideæ. Thus we obtained

a positive culture in some instances. In such a case we could assume that the lesions lay farther up in the large intestine and could not be reached by the sigmoidoscope.

There was no difficulty in taking cultures from the inflamed area itself by the aid of the sigmoidoscope. In some cases positive cultures were obtained directly from the lesion, when stool cultures, made on the same day or just before the sigmoidoscopic examination, were negative. This sigmoidoscopic method seems to have given more regular results than the mere stool method.

Notwithstanding the fact that cultures were secured from an apparent ulcer it occasionally happened that they were negative.

A review of our investigations already mentioned brings out the fact that so-called healthy carriers of dysentery bacilli giving no history of the disease actually present the same condition as do chronic or convalescent carriers. They are nothing but chronic cases of bacillary dysentery with slight pathological manifestations, such as minute ulcers and catarrhal inflammation of the mucous membrane of the large intestine in the majority of cases. This means ambulatory cases so mild that they were not even clinically suspected, though the pathogenic germ persisted for weeks in the stools in small or in large numbers, and was being excreted at varying intervals of time.

According to our investigations concerning the carrier state we estimate that one in every two hundred recruits from the general population is a dysentery carrier. This condition constitutes a great menace to the public, especially in the summer time. These bacillus carriers may be the chief factor in the spread and persistence of bacillary dysentery. The fact that healthy dysentery carriers have been found to exist during the off season is very important, from the viewpoint of epidemiology and preventive medicine. It is, furthermore, a direct demonstration of the pathologic condition which is responsible for the carrier state in bacillary dysentery.

SUMMARY

1. Recruits entering the military service in Japan and trained soldiers belonging to the Reserve Corps were examined for the purpose of finding bacillus carriers, as soon as they entered the army in Tokyo. Among the two thousand eight hundred forty-seven recruits of the Japanese Imperial Guards Regiments (infantry and cavalry) we found fifteen healthy dysentery carriers (0.52 per cent). Healthy carriers of dysentery bacillus were also found among enlisted men who were living in the

barracks in Tokyo and who were all in perfect health. Fifteen men (0.32 per cent) out of four thousand six hundred forty-eight examined were found to harbor the dysentery bacillus. The carrier rate among recruits entering the barracks was a little higher than among soldiers who were living in the barracks. Both groups, however, showed the almost general presence of dysentery carriers.

2. As to the types of dysentery bacillus, from the total of thirty carriers we isolated "Y" (Hiss-Russell) type in seventeen cases, Flexner in ten, nonfermenter of mannite in two, and the typical Shiga bacillus in only one case.

3. The excretion of the pathogenic germ was very irregular. Continuous excretion was rarely observed. On the contrary, in a majority of cases periods of positive cultures for a longer or shorter time were followed by periods of negative cultures for a varying length of time. In some instances the negative periods were as long as four weeks.

4. In most of the cases the carrier state persisted for a considerable time, including a certain lesion in the intestinal canal on one hand and the elimination of the germ in the stools on the other. Some of the carriers passed dysentery bacillus in their stools for as long as thirteen weeks after their detection as dysentery carriers.

5. We applied the sigmoidoscope to the examination of dysentery carriers. By the aid of this apparatus we observed, in most of the cases, ulceration or some other sign of inflammation on the mucous membrane of the lower part of the sigmoid flexure and of the rectal ampulla.

6. In cultures made from the ulcers, mucus, or pseudomembrane we secured colonies of dysentery bacillus in greater or lesser numbers. In some instances they grew in almost pure cultures and without difficulty. The sigmoidoscopic method enabled us to obtain more regular results than did the stool cultures.

7. We believe that the great majority of so-called healthy or contact dysentery carriers are nothing but very mild cases of dysentery with such slight pathological and clinical manifestations that an infection by *Bacillus dysenteriæ* is not suspected.

NOMENCLATORIAL NOTES ON THE JASSOIDEA, V

By C. F. Baker

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Jassus dubiosus nom. nov. for *Jassus dubius* Osborn, 1924, not *Jassus dubius* Walker, 1851.

Thamnotettix reiteratus nom. nov. for *Thamnotettix chapadensis* Osborn, 1924, not *Thamnotettix chapadensis* Baker, 1923.

Thamnotettix luteosus nom. nov. for *Thamnotettix luteus* Osborn, 1924, not *Thamnotettix luteus* (C. Sahlberg), 1871.

TWO CORRECTIONS IN NOTES ON THE JASSOIDEA, IV

The name *Erythroneura lawsoni*, proposed by me [1] for a species in the Jassoidea, is preoccupied; I therefore propose the name **Erythroneura lawsoniana** nom. nov. instead.

Also, in the same paper, the authority for *Athysanus coronatus* should be Berg, not Bergroth.

[1] Philip. Journ. Sci. 27 (1925) 537.

NEW CURCULIONIDÆ FROM THE MALAY ARCHIPELAGO (COLEOPTERA)

By Guy A. K. Marshall
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Among some Curculionidæ, principally from Sandakan, British North Borneo, kindly submitted to me by Prof. C. F. Baker, there occurred several new species, which are described in the following pages.

The type specimens of all the species will be deposited in the British Museum.

OTIORHYNCHINÆ

Epicalus sandakanus sp. nov.

Male and female.—Integument piceous, clothed with dense sandy brown scaling, which is rather paler beneath, and set dorsally with short erect spatulate setæ.

Head with the coarsely facetted eyes subdorsal and not prominent, their convexity exceeding but little that of the head; the forehead almost flat transversely, its width equal to the length of an eye, and with a row of four or five suberect spatulate setæ on each side; the sculpture entirely concealed by the scaling. Rostrum somewhat broader than long, parallel-sided in the basal half and very slightly wider in front; the median dorsal area of about one-third the total width, gradually narrowing from the base to the antennæ, then dilated and deeply impressed at the apex, the anterior margin being a posteriorly concave high transverse carina, which unites the apices of the scrobes and forms the basal margin of the almost vertical epistome, the anterior edge of which is not emarginate; the scrobes short and broad, curving inward behind; the mentum with three setæ on each side. Antennæ with the scape curved in the basal third, thence straight, very gradually widening at the apex, densely squamose and with erect spatulate setæ; the funicle with joint 2 very slightly longer than 1, the remainder subequal, squamose and with spatulate setæ, except joint 7 which has fine setæ and no scales. Prothorax very slightly broader than long,

gently rounded at the sides, widest in the middle, shallowly constricted near the apex, which is not narrower than the base, the latter being bisinuate; the dorsum almost flat longitudinally, rugosely punctate, with a shallow curved transverse impression at one-third from the apex and a shallow rounded depression on each side behind the middle, but the sculpture almost entirely hidden by the dense scaling. Scutellum very small, squamose. Elytra ovate, separately rounded at the base, much wider than the prothorax at the rounded subrectangular shoulders, gently rounded at the sides and widest well behind the middle; the striæ with their shallow punctures entirely hidden by the scaling; the intervals broad, gently convex, and densely squamose, each bearing an irregular row of short erect spatulate setæ, and interval 1 not elevated posteriorly. Legs densely squamose; the femoral tooth situated at about the middle of the femur; the intermediate tibiæ strongly curved.

Length, 2.7 to 3 millimeters; breadth, 1.2 to 1.3.

BORNEO, Sandakan (*C. F. Baker*).

The genotype, *E. virgatus* Motschulsky (1858), differs in having the sides and lower surface of the body clothed with metallic green scales; the rostrum is much narrower, and the forehead relatively broader; intervals 1, 3, and 5 on the elytra are more raised than the others, and the setæ are minute and recumbent.

EREMNINÆ

Phytoscaphus arcticollis Boheman.

This is the only species of *Phytoscaphus* hitherto recorded from the Philippine Islands, and all of the specimens of the genus submitted by Professor Baker appear to be referable to it, for the slight differences observable among them probably represent only local variations.

It would seem that in this insect the median carina on the rostrum is complete only in the female (and then often partly concealed by scaling), whereas in the male it is present only at or near the apex. The thorax is somewhat variable in shape, especially in the male, in which sex it is broader and more strongly rounded at the sides. The male also differs in having the external angles of the interantennal area of the rostrum slightly more prominent than is the case in the female.

It may here be mentioned that the name of this species is wrongly given as *articollis* in Gemminger and Harold's catalogue. It is true that it was so spelled in the text of Schoenherr's Genera

et Species Curculionidum, but it was printed as *arcticollis* in the index to volume 7, and the misprint in the text was corrected in the Corrigenda attached to volume 8, part 1.

Phytoscaphus arcticollis banahaonus subsp. nov.

This race differs from the typical form in having the forehead slightly wider, it being very nearly as wide as one of the eyes; in the apical impression on the rostrum the median carina is entirely or almost entirely obliterated; and the setæ on the elytra are somewhat longer and distinctly more numerous.

Philippine Islands, Luzon, Mount Banahao (*Baker*).

Phytoscaphus arcticollis cretaceus subsp. nov.

In this race the color of the scaling is chalky gray, occasionally uniform, but usually very faintly mottled with pale buff or darker gray.

Differs from the typical form in having the forehead and the dorsal area of the rostrum narrower, the latter being but little wider than the apex of the scape; and the median darker and more rugulose area on the pronotum is absent or very indistinct. In the only female seen (from Leyte) the median carina on the rostrum is much more strongly developed than in the typical form.

Philippine Islands, Mindanao, Iligan, Lanao (*Baker*). Leyte, Tacloban (*Baker*).

HYLOBIINÆ

Seleuca foveicollis sp. nov.

Male and female.—Color black, without scaling.

Head closely and strongly punctate throughout. Rostrum stout, strongly curved, parallel-sided; in male with three straight dorsal carinæ that are equally elevated and disappear toward the base, a narrow, very sinuous lateral carina, a furrow just above the scrobe and continuing a little beyond it, and a fringe of five or six setæ projecting on each side from the lower surface in the apical half; in the female the carinæ are less distinct, the antennæ are inserted a little farther from the apex, and the fringe of setæ is absent. Antennæ with joint 1 of the funicle nearly twice as long as 2. Prothorax as long as broad, very slightly widening from the base to the middle, then narrowing rapidly in front and shallowly constricted near the apex, the apical margin gently sinuate in the middle; the dorsum strongly punctate, but the punctures separated for the most part by spaces that are equal to or greater than their

diameter, and with a large rounded fovea in the middle of the basal half; the discal punctures largest near the base and diminishing gradually in front, but becoming much larger and reticulate toward the sides; laterally each puncture bears a short curved seta. Elytra much wider than the base of the prothorax, parallel-sided from the shoulders to well behind the middle; the striæ broad and deep at the sides and apex, intervals 6 to 10 being narrowly carinate, but striæ 1 to 4 merely punctate and not impressed in the basal half, the intervals there being flat and broad; all the intervals with a row of short stout curved pale setæ; the posterior callus obsolete. Legs black, coarsely punctate and setose; the femora with a single stout tooth placed beyond the middle; the front tibiæ shallowly sinuate internally in the basal half; the tarsi piceous.

Length, 3.9 to 4.8 millimeters; breadth, 1.5 to 1.8.

BORNEO, Sandakan (*Baker*).

Seleuca linearis sp. nov.

Female.—A black scaleless species very similar to the preceding one, but smaller and proportionately much narrower, and differing also in the following characters:

Head separated from the rostrum by a much deeper transverse impression. Rostrum closely and rather rugosely punctate, but without any dorsal carinæ and without any lateral stria above the scrobe. Prothorax a little longer than broad, not constricted at the apex, with the apical margin not sinuate, and the dorsal punctures much smaller. Elytra much narrower, only a little broader than the prothorax, with the lateral striæ quite shallow and only interval 10 narrowly carinate.

Length, 3.3 to 3.9 millimeters; breadth, 0.9 to 1.2.

BORNEO, Sandakan (*Baker*).

Seleuca hispida sp. nov.

Male.—Color black, without scaling.

Head finely and closely punctate, the depression separating off the rostrum rather shallow, as in *S. foveicollis* sp. nov. Rostrum very strongly curved, especially near the base, and slightly dilated at the insertion of the antennæ; viewed laterally, deepest near the base and gradually narrowing to the apex; the whole surface coarsely and closely punctate right to the apex, with three very narrow undulating dorsal carinæ and without any distinct sulcus above the scrobe. Antennæ with joint 1 of the funicle twice as long as 2. Prothorax about as long as broad,

gently rounded at the sides, widest in front of the middle, and constricted at the apex, the apical margin truncate dorsally; the dorsum coarsely and reticulately punctate throughout and without any median fovea; each puncture with a short erect spatulate seta. Elytra much broader than the prothorax, parallel-sided from the shoulders to the middle, then gradually narrowing behind, with a rather deep anteapical impression, but with no prominent callus above it; the discal striæ very shallow and containing large oblong punctures, but becoming much deeper behind and with the punctures almost obsolete; the lateral striæ broadly but shallowly sulcate; the dorsal intervals rather narrower than the punctures, somewhat uneven and becoming rugulose near the base, the lateral ones subcarinate; each interval with an unevenly spaced row of broadly spatulate, erect, whitish setæ. Legs piceous, with the tarsi paler, coarsely punctate and setose; the femora with a sharp erect tooth, placed at about the middle in the posterior pairs and beyond the middle in the front pair, the front tibiæ subangulate internally beyond the middle and strongly curved in the basal half.

Length, 3 millimeters; breadth, 1.2.

BORNEO, Sandakan (*Baker*).

Seleuca saravacana sp. nov.

Male and female.—Integument black, with fairly dense pale buff or brownish gray scaling above; the pronotum covered with rather sparse ribbonlike scales lying transversely, with a broad indefinite denuded median stripe; the elytra more densely squamose, the scales being much smaller than those on the pronotum and broadly truncate at their apices, and the following areas more or less denuded: The whole of intervals 1 and 11, intervals 9 and 10 on the apical two-thirds (except that interval 9 has a small patch of scales on a line with ventrite 3 and another at the apex), and the greater part of the apical declivity; irregularly scattered about the elytra are small groups of erect or suberect scales like those on the pronotum, these being placed close together in single longitudinal rows containing 4 to 10 scales; the lower surface sparsely covered with small hairlike recumbent scales, one in each puncture.

Head with very shallow punctures, each containing a small scale; the transverse impression delimiting the rostrum well marked. Rostrum stout, strongly curved, and parallel-sided, deepest near the base and gradually diminishing to the apex; in the male, rugosely punctate and squamose throughout, except at

the extreme apex, and with three bare, equally raised, narrow dorsal carinæ, the outer ones coalescing with the median at a little distance from the base, and with a broad shallow sulcus just above the scrobe but not extending beyond it; in the female, the rostrum slenderer, slightly narrowing from base to apex, finely punctate on the apical third, and with only the median carina distinct. Antennæ with joint 1 of the funicle as long as 2 + 3. Prothorax about as long as broad, feebly rounded at the sides, widest in front of the middle, and distinctly constricted at the apex, the apical margin gently sinuate in the middle; the dorsum strongly and closely punctate throughout, the intervals being much narrower than the punctures, and without any median fovea. Elytra oblong-ovate, widest a little behind the shoulders and much wider than the prothorax, the lateral outline (as seen directly from above) rather uneven and shallowly sinuous; the posterior calli strongly developed, and a broad shallow transverse depression on each elytron at one-third from the base; the striæ narrowly impressed only at the apex and on the inflexed margin, the dorsal rows of punctures being completely hidden by the scaling; the intervals broad, flat, and (where denuded) finely rugulose, the lateral ones not carinate, and the junction of intervals 3 and 9 at the apex forming a squamose callus. Legs closely and strongly punctate, the scaling dense on the apical half of the femora (especially dorsally) but sparse elsewhere; the femora with a strong sharp tooth beyond the middle and another minute one beyond it; the front tibiæ bisinuate on the inner edge; the tarsi piceous.

Length, 5.4 to 6 millimeters; breadth, 2.1 to 2.4.

BORNEO, Sarawak (*Dr. E. Mjöberg*).

The following key may facilitate the identification of the species of this genus:

Key to the species of Seleuca Pascoe (1871).

1 (6). Front femora with a second minute tooth; elytra clothed with scaling and with the posterior calli well developed.

2 (3). Pronotum with a large round impression in the middle of the basal half..... **S. amicta Pascoe.**

3 (2). Pronotum without any impression.

4 (5). Prothorax gradually narrowed at apex, with separated punctures (the intervals being at least as broad as the punctures), and with a lateral stripe on each side composed of dense subcircular or shortly ovate white scales; elytra with numerous subcontiguous spots of white scales, which are narrowly ovate and pointed at the apex, and without erect scales.

S. leucospila Pascoe.

5 (4). Prothorax constricted at apex, with coarse subreticulate punctures (the intervals being much narrower than the punctures), and rather thinly clothed with elongate ribbonlike transversely placed buff or gray scales, except for a broad median denuded stripe; elytra fairly densely clothed (except on the suture, the extreme lateral margin, and the posterior declivity) with buff or gray scales which are broadly truncate, and with irregular short longitudinal groups of elongate suberect scales.
S. saravacana sp. nov.

6 (1). Front femora with only one tooth; elytra without scaling, the posterior calli obsolete.

7 (10). Pronotum with separated punctures on the disk, and a median fovea behind the middle; elytra with narrow setæ, which are recumbent on the basal half and suberect behind; hind femora with the tooth well beyond the middle.

8 (9). Elytra much broader than the prothorax; prothorax as long as broad, constricted at apex, the anterior margin distinctly sinuate in the middle..... **S. foveicollis sp. nov.**

9 (8). Elytra only slightly broader than the prothorax, general form subcylindrical, prothorax somewhat longer than broad, not constricted at apex, the anterior margin not sinuate.
S. linearis sp. nov.

10 (7). Pronotum with closely reticulate punctures and no median fovea; elytra with broadly spatulate erect setæ throughout; hind femora with the tooth at about the middle..... **S. hispida sp. nov.**

ANTHONOMINÆ

Demimaea bakeri sp. nov.

Male and female.—Integument shining black, with the apical declivity, and especially the apical margin, more or less piceous; the prothorax with sparse suberect setæ, those on the dorsum black, the lateral ones white; the elytra with sparse erect black setæ, a broad thin band of recumbent white setæ across the basal fourth, and another across the top of the declivity, these two being united by a narrow line of white setæ along the suture; the lower surface thinly clothed with short white setæ.

Head with scattered shallow punctures, and a bare smooth patch in the middle of the forehead. Rostrum much deflected, stout, but narrower in the basal third, the dorsal outline moderately curved in the male, less so in the female, the ventral almost straight; with rather coarse shallow punctation, and with five distinct carinæ, the median one being usually rather broader and smoother than the others. Antennæ testaceous brown; the funicle with joint 1 much longer than 2, the remainder beadlike. Prothorax strongly gibbous and inflated dorsally, the anterior slope being much steeper than the posterior one, moderately rounded at the sides, widest a little in front of

the middle, only slightly narrower at the apex than at the base, and shallowly constricted near the latter; the dorsum with a shallow transverse depression near the apex and fairly evenly set throughout with rounded punctures, the spaces between which are nearly or quite as wide as the punctures themselves, there being a very indefinite median impunctate line on the anterior half; the sparse setæ on the dorsum and pleuræ all simple, the black dorsal ones longer and more erect than the white lateral ones, but at the basal angles there is a short transverse marginal line of small feathery white scales. Scutellum with very dense feathery white scales. Elytra subtriangular, widest at the shoulders and thence rapidly narrowing to the apex, and with a shallow transverse depression at one-fourth from the base between striæ 1 and 3; the dorsal outline rising gradually from the base to well behind the middle and then sloping very steeply straight to the apex; the striæ shallow, their inner margin forming on the disk a sharp edge (when viewed obliquely from the side), the contained punctures small and widely spaced, but placed much closer together near the base; the intervals broad, smooth, and plane; the white setæ on the basal band all simple, those along the suture and the median part of the declivity all feathery (but a few erect simple white setæ on the latter area), and those at the sides of the declivity simple, bifid, or trifid; on interval 1 behind the middle and on interval 5 just behind the basal white band, a longitudinal tuft of dense dark erect setæ. Legs black, thinly clothed with subrecumbent white setæ, which are mostly simple, but with denser feathery setæ at the apices of the femora and a few at their bases; the femora with a minute tooth; the tarsi and tips of the tibiæ red-brown. Venter with the first visible ventrite flattened in the middle in the male.

Length, 3 to 3.25 millimeters; breadth, 1.6 to 1.8.

Malay Peninsula, Singapore (type) and Penang (*Baker*).

Nearly allied to the genotype, *D. luctuosa* Pascoe (1870), but the latter is a larger insect, with similarly disposed but much denser white clothing; it also differs, inter alia, in having only a single carina on the rostrum; the prothorax is parallel-sided in the basal two-thirds, not gibbous dorsally, and bears larger and closer punctures; and the white bands on the elytra are made up almost entirely of dense feathery setæ.

Faust [1] has quite rightly pointed out that Pascoe was in error in attributing his genus *Demimaea* to the Strangaliodides, but

[1] Ann. Mus. Genova 34 (1895) 224.

the place to which he himself assigned it (in the Gonipterinæ) is almost as unsatisfactory. In Lacordaire's classification the genus would come in the Anthonominæ, among which it has obviously close affinities with Schoenherr's genera *Minyrus*, *Thamnobius*, and *Pansmicrus*.

ALCIDINÆ

Alcides centroguttatus sp. nov.

Female.—Integument piceous, the prothorax having on each side a rather narrow, very ill-defined, oblique stripe of cream-colored scaling running from the apex (on a level with the upper margin of the eye) to the base opposite interval 5 of the elytra; below this a much broader and denser stripe running obliquely forward from the basal angle to the front of the coxæ, the space between the front coxæ being also densely squamose; the elytra with an elongate pear-shaped patch (1.5 millimeters long) of dense erect blackish scales just behind the scutellum, lying on interval 1 basally and extending on to 2 behind; the rest of the dorsal area thinly clothed with minute narrow pale scales, with an ill-defined blackish band across the top of the declivity, which is narrowest at the suture and widens and curves forward laterally; this band edged anteriorly with a narrow line of pale scaling, which also curves forward at the sides and unites with a small patch of dense scaling on intervals 8 and 9 behind the middle (the patch shorter on interval 9 than on 8); adjoining this scaling in front is a subquadrate blackish lateral patch extending from the side margin to stria 7, and in front of this a small elongate spot of dense pale scaling on interval 11; intervals 9 and 10 with dense scaling at the apex; the metasternum densely clothed with broad fimbriate pale scales, the venter with much sparser small narrow scales.

Head with coarse shallow punctation and rather dense curved fulvous scales; an irregular transverse impunctate ridge across the middle; the forehead flattened and with a low median carina bearing a very small fovea. Rostrum elongate, a little shorter than a front femur, quite cylindrical, almost straight, not dilated at the apex, with coarse confluent punctures in the basal half, and there with a sharp narrow median carina, and on each side of it a broad furrow completely filled with dense suberect fulvous scales. Antennæ with the scape as long as the funicle, joint 1 of the latter shorter than 2 + 3, and 7 slightly longer than the club. Prothorax broader than long, parallel-sided from the base to beyond the middle, and abruptly con-

stricted at the apex; the dorsal anterior margin distinctly arcuate, the postocular lobes feeble and fringed with vibrissæ; the dorsum fairly closely covered with rounded granules, each bearing a very short recumbent seta, the apical area with very shallow distant punctures. Scutellum small, pyriform, broadest behind, not inclosed in front. Elytra subcylindrical, only slightly wider at the shoulders than the base of the prothorax, without any transverse basal depression; the deep rounded foveolæ separated by more than their own diameter, except near the base, where the sculpture is more rugose; the intervals a little broader than the foveolæ, very finely rugulose, and each bearing a row of numerous low shiny granules; the scales forming the pale markings oblong and curved, sometimes fringed at the apex, but never feathery. Legs with rather sparse pale scales, which are denser at the apex of the hind femora and along the lower edge of the anterior pairs; the femora transversely rugulose, the front pair with a large sharp tooth, with four denticles on its anterior edge just like that of A. *pyrifer* Marshall;[2] the middle femora with a similar but smaller tooth, and that on the hind pair still smaller and simple; the front tibiæ only slightly curved dorsally and with a sharp rectangular tooth at the middle of the inner edge.

Length, 8 millimeters; breadth, 3.

BORNEO, Sandakan (*Baker*).

This species in its general facies quite resembles *A. patruelis* Faust (1892), but is readily distinguishable from it and other allied species by the pear-shaped black patch on the elytra, and by the sharp carina and scale-filled sulci on the rostrum; though perhaps the latter characters may be confined to the male sex.

ITHYPORINÆ

Colobodes lophonotus sp. nov.

Male.—Integument black; the head with whitish gray scaling and two large brownish patches on the vertex; the pronotum with dense whitish scaling and with a transverse discal row of four dense erect tufts composed of long stout yellowish white setæ; the elytra with mingled whitish gray and pale brown scaling, and with a very large and long tuft of brown setæ before the middle on interval 3 and a much smaller one at the apex of interval 5; the lower surface with dense grayish white scaling.

Head with very short dense erect scales which conceal the sculpture; the forehead flattened, without any median sulcus,

[2] Ann. & Mag. Nat. Hist. IX 9 (1922) 394, fig. *d*.

covered with broad recumbent scales, and with a row of four erect setæ on each side. Rostrum rather stout, somewhat shorter than the pronotum, only slightly curved, and a little dilated at the apex; the dorsum with shallow reticulate punctures and a fine median carina, the sculpture in the basal half obscured by dense scaling and scattered stout short erect setæ. Antennæ red-brown; the funicle with joint 1 as long as but much thicker than 2, and 3 to 5 moniliform. Prothorax somewhat broader than long, widest near the base, gradually narrowing to beyond the middle, and abruptly constricted and subtubulate at the apex; the base shallowly bisinuate, the basal angles rounded, the apical margin strongly arcuate and much produced dorsally; the dorsum with the punctures hidden by large flat (or sometimes shallowly concave) overlapping scales, with the lateral margins appearing rather flattened and explanate in the basal third owing to the dense scaling being produced over the bases of six stout horizontally projecting setæ; of the four discal tufts of setæ the outer ones are narrower (being obliquely longitudinal), rather shorter, and contain twelve to fifteen setæ, whereas the inner ones contain about twenty-five; on the apical area are scattered erect setæ of varying lengths. Scutellum small, subcircular, bare. Elytra oblong-ovate, appearing to be only slightly broader at the shoulders than the base of the thorax; the striæ shallow and with large shallow punctures dorsally (but much obscured by the scaling) and much deeper laterally; interval 3 with a granulate elevation close to the base, immediately followed by a very large dense conical tuft of stout brown setæ (the longest 1.5 millimeters in length); interval 5 granulate in the basal third and there with a row of six to eight closely placed erect setæ, and with a small elevation at its apex bearing a tuft of about twelve pale setæ; the remaining intervals even and each bearing a row of distant long erect setæ, but intervals 6 and 8 without setæ until behind the middle. Legs with dense, overlapping and often shallowly concave, uniform gray scales and short erect setæ.

Length, 5 millimeters; breadth, 2.4.

BORNEO, Sandakan (*Baker*).

Readily distinguished from the previously described species of the genus by the very long tufts of setæ on the pronotum and elytra.

NOTES ON PHILIPPINE HYDROPHILIDÆ

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The records of Philippine palpicorns are very meager. The Baer Catalogue [1] includes four species, and Atkinson [2] was acquainted with only five, of which one (*Hydrous ruficornis* Boisduval nec Klug) remains doubtful. Schultze's recent list [3] is not more extensive, for merely eight forms were known at the time his paper was written. Adding to these enumerations the isolated published names brings the total to only a dozen recorded species; all of which seems to indicate that the fauna of these innumerable islands, which must be rich, is practically unknown. We must therefore be thankful to Professor Baker who has organized general and scientific collecting of the insects inhabiting his country, and I am glad that he has been willing to entrust me with the study of his material. When this study was going on I received from Mr. Staudinger and Bang-Haas one lot of nearly six hundred Philippine Hydrophilidæ and another lot, less numerous in individuals, through the kindness of M. R. Peschet of Paris. I have thus been able to draw up a list, already more substantial than that of my predecessors, but am convinced that there remains still much to be done, especially when the interior of the islands, including the smaller ones, shall have been thoroughly investigated.

The study of this material indicates that the hydrophilid fauna of the Philippine Islands has a strong Indo-Malayan character, as could be foreseen, judging by the geographic position of the country.

HYDRAENINÆ

Hydraena (s. str.) scabra sp. nov.

Sat curta, parum nitida; capite obscuro, piceo, thorace elytrisque dilutioribus ferrugineis, illo in disco obscuriore; thorace

[1] Ann. Soc. Ent. Fr. VI 6 (1886) 106, 107.
[2] Journ. As. Soc. Bengal 59 (1890) Suppl. 2 (1891) 164–170.
[3] Philip. Journ. Sci. § D 11 (1916) 1–194.

irregulariter sexangulato, crebrius sed minus fortiter ut in *H. pennsylvanica* punctato, lateribus haud profunde foveatis haud explanatis, foveis obliquis prescutellaribus manifestis; elytris explanatis, postice truncatis, punctis quadratis seriatis; palpis pedibusque testaceis.

Type.—My cabinet. Philippine Islands, Luzon, Laguna, Montalban, one specimen, 1.3 by 0.6 millimeters (*Boettcher* leg.).

This species belongs to the group of *palustris* Erichson (Europe) and *pennsylvanica* Kiesenwetter (America), but it is of smaller size, of lighter color, less elongate, having like these forms the anterior margin of pronotum sinuate toward the rear and the pronotum not much narrowed toward the head, but the punctuation of pronotum is finer, denser, and more crowded, the elytra are truncate at the extremity, although they are separately rounded here, they do not cover entirely the abdomen in the only individual at my disposal and are more explanate on the sides than in the compared species.

Head not grooved in the middle basally, of a dark brown color varying to black, rugosely punctate posteriorly. Labrum bilobate. Palpi elongate, the second joint nearly as long as the head, very slender, hardly thicker toward the extremity, third only half as long as second, straight, regularly thickened toward the apex, fourth a little shorter than second, a little thickened beyond the middle and tolerably pointed.

Pronotum of a ferruginous color, darkened upon a transversal quadrangular space in the middle of disk, which does not touch the four sides, having its greatest width beyond the middle, not much narrowed anteriorly, anterior angle decidedly more nearly rectangular than in *pennsylvanica,* the postero-lateral sinus of sides tolerably indicated, before this sinus the sides are not bisinuate; posterior margin nearly straight, anterior margin less deeply sinuate than in *pennsylvanica.* Lateral serration finer. Antero- and postero-external impressions shallow, antero-transversal depression and prescutellar impressions more distinct. Punctuation of pronotum very crowded, the punctures nearly confluent, stretched out longitudinally and separated by a space much narrower than their own diameter.

Elytra of same color as sides of pronotum, a little clearer in the lateral extension, very finely denticulate at the sides, these sides distinctly and tolerably explanate, with a wider lateral channel [4] than in the compared species. Elytral series of punc-

[4] Gouttière of French authors.

tures composed of elongated, nearly quadrangulate punctures, separated in the length as in the width by an interstice much narrower than their dimensions, the longitudinal intervals having thus the appearance of regular, very narrow, and not much elevated lines. Nine series of punctures are present between the scutellum and the humeral callus and in addition five or six between the latter and the lateral margin. Toward the extremity these series become irregular, but yet with good light one can see that the external series remains parallel to the external margin of elytra as far as the posterior truncature of the latter and the internal series is crowded against the external. The elytra are covered with microscopical, very indistinct procumbent hairs. Epipleuron (or false epipleuron) wide but regularly narrowed to the beginning of the posterior truncature.

Prostethium finely and longitudinally carinated in the middle. Glabrous spots of metasternum indistinct or wanting. Middle of metasternum with an elongate and shallow, posteriorly widened impression. Fifth, sixth, and seventh abdominal segments shining (? female). Intermediate and posterior coxæ more separated than the anterior. Legs, including coxæ, and maxillary palpi uniformly of a light ferrugineous color.

SPERCHEINÆ

Spercheus stangli Schwarz and Barber, 1918.

I have not seen Philippine specimens. The typical specimens were captured by Mr. P. Stangl in Luzon, Laguna Province, Bay.

HYDROCHINÆ

Hydrochus annamita Régimbart, 1903.

Of this species, which is also represented in Assam and Tonkin, I have seen good series from different localities in Luzon communicated by Peschet and by Staudinger: Manila, Kavignian, Mount Banahao.

SPHAERIDIINÆ

Coelostoma stultum Walker, 1858.

simplex Sharp, 1874.

This species, very widely distributed in the Indo-Malayan region, including Formosa, was captured in the Philippine Islands by Professor Baker and was received also from other sources: Los Baños, Mount Maquiling, Manila (Luzon); Surigao (Mindanao); also at Catbalogan. It is readily distinguished from the following by the undersurface of its median femora, which

are only provided with sparse short and stiff hairs and not with any dense procumbent hydrofugal pubescence. The interstices of the hairs appear in consequence glabrous and brilliant.

Coelostoma horni Régimbart lazarense var. nov.

Late ovale, nitidum, supra nigrum, punctulatum, punctis maxime parvis et sat sparsis, palpis et antennis (totis) rufescentibus; prostethio in medio longitudinaliter tectiformi, antice dentato; mesosternello in medio elevato, parte elevata aream rhomboidalem in medio tectiformem formante; femoribus intermediis subtus dense pubescentibus, posterioribus haud dilatatis, subtus leviter et parce punctato; tibiis posterioribus subtus leviter punctato, tarsis intermediis et posticis haud brevibus; abdominis segmento basali in medio a ponte inter coxas obscure carinato.

Type.—My cabinet. Philippine Islands: Montalban (*Boettcher* leg.), 4.2 by 2.5 millimeters.

This new variety, or perhaps geographical race, seems to be peculiar to the Malayan Islands. I have not received it from elsewhere. Seen from the upper side the beetle seems very like the preceding but is far less punctulate, the most striking differentiating character occurring on the underside of the intermediate femora. Clothed with a silky, procumbent, and very dense pubescence which does not permit one to see the surface of the interstices. This character seems to be of higher than specific rank, for I am acquainted with other species which present it. The Philippine specimens received [Montalban, a good series; Manila (*Baer*), one individual, Philippine Islands (without locality—British Museum)] are much alike. I had taken the first specimen seen for *C. transcaspicum* Reitter, 1906, from Transcaspia, Buchara, Eschitschau-bau, but the type of this species (Budapest Museum) was not accessible. Owing to the kindness of M. Knisch of Vienna I have now been able to study a cotype of *transcaspicum* (Buchara) and another of Novo Saratov (Transcaspia). I can state that the Philippine form is distinct, although Reitter's species presents the same character on the underside of the middle femora. The dorsal punctuation of head, pronotum, and elytra is much finer and sparser than in *stultum, transcaspicum,* and *horni* Régimbart but a specimen from Manila (*Baer*) has the punctuation of elytra, although

sparse and distinctly coarser, and this is even much more the case in two specimens from Palembang (Sumatra) in my collection.

More convex than *transcaspicum* and pronotum less broad and short. Upper side very shining owing to the minute size of the punctures and distinguished chiefly by this from typical *horni*.

Head and pronotum very finely and sparsely punctured, punctures of elytra of nearly same size, more separated from one another, although they are denser around the scutellum; the latter also sparsely and finely punctulate. The shallow sutural stria does not continue to the basal third. Palpi, antennæ, including club, and tarsi rufescent or yellow. Underside including the femora and tibiæ washed with an obscure red tinge. Mentum very smooth, very finely and very sparsely punctulate, with an anterior, very deep, half-round depression. The punctuation of the underside of posterior femora is nearly imperceptible, being truly microscopical. Metasternum not very narrow between the middle coxæ with elevated part forming a narrow and elongate triangular shining area not well defined. First abdominal segment practically not carinate in the middle but with a short, very faint, tectiform longitudinal elevation between the coxæ.

Named for the Isles of S. Lazar, the older name of the Philippine Islands.

Dactylosternum abdominale Fabricius, 1792.

insulare Laporte de Castelnau.
? nitidum Boheman, 1851.
rousseti Wollaston, 1854.
? mulsanti Murray, 1859.
natalense Gemminger and Harold, 1868.
semistriatus Schaufuss, L. W., 1887.
insulare var. Kuwert, 1890.

Of this species, known from nearly all the warmer regions of the globe, I have seen but one individual from the Philippine Islands, taken at Manila (my cabinet, *Boettcher* leg.). The synonymy of *Cyclonotum mulsanti* Murray [5] is based upon an individual from Kamerun determined by Kuwert, and also in my cabinet. Captured also by Baker at Singapore and Penang Island.

[5] Ann. & Mag. Nat. Hist. III 4 (1859) 352.

Dactylosternum dytiscoides Fabricius, 1775.

melanopterum MONTROUZIER, 1855.
cowleyi BLACKBURN, 1898.

I have seen but one individual labeled "Luzon" in the Deutsches Entomologisches Institut, Berlin, and another from Aru (British Museum) of this widely distributed Malayan species. Known also from Malacca and Ceylon. The synonymy of *Cyclonotum cowleyi* Blackburn [6] is based on a specimen from the typical locality, Cairns, Queensland, kindly sent for my cabinet by Mr. Lea and determined by him. I possess another specimen from Australia, without other locality, and the species has also been found at Sandakan, Borneo, by Baker.

Dactylosternum hydrophiloides W. S. MacLeay, 1825.

? nitidum LAPORTE DE CASTELNAU, 1840.
capense MULSANT, 1844.
rubripes BOHEMAN, 1858.

Described by Boheman as *Cyclonotum rubripes* from Manila and later cited from the Philippine Islands by Baer, Atkinson, Régimbart, and Schultze. I have seen a small series from various localities of this common beetle sent by Baker (one individual, determined as *capense* by Heller), Brussels Museum (one), Staudinger (fifteen); Luzon: Manila, Bayombong, Mount Banahao, Imugan; Leyte; Biliran. Captured also by Baker at Singapore and Sandakan, Borneo, the latter individual immature and wholly reddish.

Dactylosternum subquadratum Fairmaire, 1849.

Luzon: Manila (Brussels Museum, two specimens); Mount Banahao and Imugan (two specimens, *Boettcher* leg.). The specimens have been compared with material of the Fauna Hawaiiensis determined by Sharp. *Dactylosternum subquadratum* seems tolerably variable, even according to the individuals in my cabinet from the Hawaiian Islands. Those of Manila are reddish (immature) and the other two recorded here have the punctuation and scratching of pronotum very much finer, especially the specimen from Mount Banahao. The Imugan one is of more depressed habit, approaching in this respect *D. seriatum* Knisch of Sumatra, Java, Engano, Mentawei, which form is perhaps not entitled to specific rank. There is also a specimen in the British Museum from the Philippine Islands, without exact locality.

[6] Trans. Roy. Soc. South Australia 22 2 (1898) 229.

Subgenus Coelofletium novum [7]

Corpus ovatum, sat convexum, prothorace elytrisque perminute reticulatis, indistincte punctatis, antennis novemarticulatis, elytris haud seriatis, haud striatis, abdominis haud carinato.

Type of subgenus, *D. exstriatum* sp. nov.

This form has no striæ or series of punctures upon the elytra, not even a shortened sutural stria, and the upper surface of pronotum and elytra is practically without punctuation. The first abdominal segment has no longitudinal carina. In other respects, facies, and morphology it is a *Dactylosternum*. One could have made of this beetle the representative of a new genus; but, considering that there are true *Dactylosternum* without the least trace of larger punctures arranged to form series (as in *fletcheri* and *coelostomoides* d'Orchymont, for instance) and that the sutural stria even has a tendency to disappear in the latter of these species, I think it not advisable to separate the new form as a genus, but to consider it merely as an extreme differentiation of the very polymorphic natural category under consideration. Besides, the absence of an elevated line on first abdominal segment does not seem to have here the same importance as elsewhere, for the tectiform ridge present in some specimens (the one from Aru, for instance; see below) is certainly representative of this absent carina.

Dactylosternum (Coelofletium) exstriatum sp. nov.

Ovatum sat convexum, haud explanatum, supra nigrum; antennarum clava laxe articulata; elytris perminutissime reticulatis, haud punctulatis, haud seriato-punctatis; prostethii longitudinaliter carinato, antice fortiter dentato; mesostethii parte elevata aream rhomboidalem, in medio longitudinaliter turgidam formante; metasterni parte elevata perminutissime regulariter, denseque punctulata; femoribus intermediis subtus regulariter punctis setigeris sat fortis, parum remotis instructis; tarsorum posteriorum articulo basali secundo tertioque simul sumptis fere aequalibus; abdominis segmento basali longitudinaliter tectiformi.

Type.—My cabinet, Luzon, Laguna, Mount Banahao (*Boettcher* leg.), one specimen; 4.2 to 5 by 2.8 to 3.2 millimeters. Also a short series (British Museum and Brussels Museum) from Manila, all of the same origin, judging from preparation and labeling; a further single individual from Aru in my cabinet.

[7] Name without significance.

Head throughout with very fine microscopical and very close punctulation and with reticulation in the intervals, black, more or less reddish on the prefrons, the Y- and antennal sutures visible only by transmitted light. Labrum transverse, rufescent, anteriorly widely and not deeply sinuate. Maxillary palpi red or yellow, shortened, second joint the longest of all and thickened, third distinctly shorter than second, fourth very little longer. Antennæ 9-jointed, the glabrous part (first disk joints) yellow, the club laxly articulated, yellow or darkened (in the Aru specimen) and longer than joints 2 to 6 taken together. Mentum red or dark, dull, very finely, evenly punctured and microscopically reticulated, widely and semicircularly impressed in front.

Punctuation of pronotum extremely fine, very much finer than on the head, and sparser. Intervals microscopically or more strongly reticulated, each puncture widened by a fine scratch drawn through it. Anterior angles of pronotum rounded, posterior more strongly indicated. Pronotum bordered on the sides and anteriorly behind the eyes more obscurely, not in the middle apically, and posteriorly not at all, even in the region of posterior angles.

Scutellum and elytra practically without punctures, the ground surface microscopically dull, still finer than on pronotum, reticulated or scratched. No sutural stria even posteriorly. Of a dark color more or less bordered with obscure transparent red on sides.

Prostethium strongly carinate in the middle, the carina gradually elevated anteriorly to form a strong tooth. Mesostethial process longer than wide, bordered all round, the sides straight, without acumination anteriorly, the middle tectiform but not sharp, rounded, continued to the metasternum without interruption. Metasternum thin between intermediate coxæ, flattened in the middle and regularly but not very much enlarged posteriorly, with very fine, dense, and regularly distributed punctures. Posterior femora wide, especially at the extremity, where they are prolonged into a lamina covering base of tibia, coated with remote and very fine, indistinct, setigerous punctures, the intermediate with much coarser and very distinct setigerous pores. Tibiæ widened, underside with very fine and remote setigerous punctures. Tarsi short, the posterior a little longer than half the length of corresponding tibia, first joint of posterior tarsus nearly as long as the two following taken together. First abdominal segment not carinate, tectiform in the Aru specimen.

All the Manila specimens seem more or less immature.

Sphaeridium dimidiatum Laporte de Castelnau, 1840.

One individual in my cabinet from Luzon and two others from the Philippine Islands, without exact locality, communicated by the British Museum.

Sphaeridium quinquemaculatum Fabricius, 1798.

vicinum Laporte de Castelnau, 1840.
tricolor Walker, 1858.
chinense Frivaldsky, 1889.

Luzon, Mount Maquiling, Los Baños (*Baker*).

Sphaeridium seriatum d'Orchymont, 1913.

Mindanao, Subaan (*Boettcher* leg., two specimens) ; also one specimen captured by Baker at Sandakan, Borneo. This specimen was determined by Heller as *dimidiatum;* it is of small size (5.75 by 3.75 millimeters) and has the subtibial armature of both hind feet composed of three spines.

Cercyon (s. str.) haemorrhoidalis Fabricius, 1775.

flavipes Fabricius, 1792.
similis Marsham, 1802.
picinus Marsham, 1802.
nigricollis Say, 1825.
suturalis Stephens, 1829.
femoralis Stephens, 1829.
infuscatum Stephens, 1829.
apicalis Dalla Torre, 1877.

One specimen from the Philippines (*O. Koechlin*) in the collection of the Deutsches Entomologisches Institut, Berlin, of this European species. Probably imported.

Cercyon (s. str.) nigriceps Marsham, 1802.

atricapillus Marsham, 1802.
laevis Marsham, 1802.
concinnus Marsham, 1802.
centrimaculatum Sturm, 1807.
atriceps Stephens, 1829.
inustum Stephens, 1829.
ustulatum Stephens, 1829.
bimaculatum Stephens, 1829.
nubilipennis Stephens, 1829.
? pulchellum Heer, 1840.
mundus Melsheimer, 1844.
centromaculatus Rey, 1886.

One specimen from the Philippine Islands (*O. Koechlin*) in the collection of the Deutches Entomotogisches Institut and

two from Luzon, Mount Maquiling (*Baker*), of very small size. This form has become nearly cosmopolitan.

Cercyon (s. str.) vicinalis Walker, 1859.

Cercyon nigriceps MOTSCHULSKY, 1863.
Cercyon atriceps GEMMINGER and HAROLD, 1868.

LUZON, Mount Maquiling, Los Baños (*Baker*); Manila (*Boettcher* leg.).

Cercyon (s. str.) lazarensis sp. nov.

Oblongo-ovalis, sat latus, convexus, niger, maxime nitidus, capite antice, pronoto antice lateribusque anguste, obscure rubro-translucido, infra obscure rubro-niger, abdomine rubro, antennis praeter clava et palpis testaceis. Capite et pronoto sat remote leviterque punctatis; elytris decem-punctato-seriatis, seriebus postice haud canaliculatis, punctis mediocribus haud approximatis; intervallis leviter fere indistincte et laxe punctatis; mesostethii parte elevata angusta, maxime elongata; metasterni parte elevata nitida, sparse et leviter punctata.

Type.—My cabinet, South Luzon: Mount Isrog (*Boettcher* leg.).

Although but one individual is available, I do not hesitate to describe this fine species as new, for I am not acquainted with any oriental form approaching it. The size is great for a *Cercyon* (4.1 by 2.5 millimeters), the upper surface is of a very brilliant black and the elytra have ten series of separated punctures which are nowhere, even at the extremity, deepened into striæ. The sutural series alone becomes a stria before the second third of elytra and is deepened gradually on approaching the extremity.

Head finely and not very densely punctulated, the intervals very smooth, not reticulated even at the base; anterior margin of prefrons finely bordered. Antennal club dark, much longer than joints 2 to 6 taken together; the basal joint nearly as long as the remainder of antenna, including the club. Palpi slender, testaceous, second joint the longest, incrassate toward the extremity, third joint much shorter, fourth nearly as long as the foregoing and of the same size. Mentum reddish, very smooth, and brilliant.

Punctures of pronotum nearly of same size and remoteness as on the head, very shining and smooth in the interspaces. Pronotum bordered on the lateral sides, but not anteriorly or posteriorly; hind and anterior angles rounded.

Scutellum with some minute punctures. Elytra punctured in the interspaces of series like the pronotum and of the same smoothness; the serial punctures are but indistinctly coarser at the extremities; lateral margins of elytra bordered, not explanate.

Prostethium short before the anterior coxæ, longitudinally carinated in the middle; mesostethial lamina very stout and high, the inferior surface of the lamina not being plane, but rounded, of navicular form, attenuated on both ends, and but gradually enlarged in the middle, nearly five or six times as long as its greatest width, shining, smooth, and finely punctulate; elevated part of metasternum pentagonal and shining black with some sparse and fine punctures. No well-defined femoral lines are present on the sides of pentagonal area. Middle of first abdominal segment with well-marked longitudinal carina. Underside of intermediate femora sparsely punctured, posterior still more finely; posterior tibiæ much longer than the corresponding femora and, like the intermediate, nearly impunctate and very smooth on the underside; tarsi slender and long with the first joint of posterior tarsi as long as the three following joints taken together.

Cercyon (s. str.) secretus sp. nov.

Late ovatus, paulum convexus, sat depressus, supra et subtus ferrugineus; elytrorum basi saltem tam fortiter punctata quam pronoto; pronoto ad basin haud marginato; subtus metasterno retrorsum acetabularum intermediorum lineas curvas et lineas femorales instructis.

Type.—My cabinet, South Luzon: Mount Isarog (*Boettcher* leg.), 3 by 2 millimeters.

Of wide, depressed, not convex form, entirely (above and below, and appendages) testaceous or reddish, hind portions of the head indefinitely clouded with obscure (post-mortem change ?), club of antennæ also yellow like the base.

Head very smooth and shining, and very finely punctured. Pronotum transversal, scarcely more coarsely punctured than the head, also shining. Anterior angles obtuse but rounded, hind angles obtuse, lateral margins bordered, nearly straight on the anterior four-fifths, then rounded to the posterior margin which is not bordered.

Elytra wide but not expanded, with ten very narrow, tolerably deep striæ bearing fine inserted punctures which become coarser

toward the sides and apex; on the sides anteriorly the striæ are reduced gradually to a series of punctures, the tenth (outer) series is nowhere striiform. Interstitial punctures distinct, much coarser than on the pronotum and head.

Mentum very smooth, nearly impunctate, with a transversal, not well-defined, deep anterior impression; palpi very slender, second joint but little incrassate, third joint nearly as long as the preceding but very much slenderer, fourth nearly as long as the third, also slender. Antennæ with compact, not obscure club, second joint very short, the third to sixth still much shorter and narrower.

Prostethium longitudinally carinate in the middle, but not cultriform: the slopes of carina obliquely ascending to the prosternum where they join an anteriorly converging fold or impression; mesostethial lamina high, anteriorly not abruptly but obliquely raised, undersurface very narrow, linear, not or very slightly incrassate in the middle. Elevated part of metasternum smooth and shining, imperceptibly and irregularly obscurely fine-punctulate, or practically without punctures. Femoral lines ascending obliquely to the extremity of second third of intermediate coxæ and from here on begins a new short line curved and prolonged as far as the middle of metaepisternum. Underside of intermediate femora with fine separated punctures; posterior very narrow and smooth and, like the middle of metasternum, practically without punctuation. Middle of underside of tibiæ with some large, elongated, and oblique spinigerous pores. Posterior tarsi slender, about as long as the corresponding tibiæ; first joint nearly as long as the following three joints taken together.

This fine *Cercyon* is not much akin to any other species I am acquainted with.

Cercyon (s. str.) lineolatus Motschulsky, 1863.

Two specimens from the Philippine Islands, without further locality, were communicated by the British Museum. Hitherto known only from Ceylon and India.

Omicrogiton insularis d'Orchymont, 1919.

A single individual of this very rare and interesting palpicorn was captured at Imugan in Luzon (*Boettcher* leg.). Also from Ceylon (Balangoda) in the British Museum.

Genus **PACHYSTERNUM** Motschulsky, 1863

In my opinion, as also in that of von Harold,[8] *Megasternum distinctum* Sharp, 1873, of Japan is the same as *Pachysternum haemorrhoum* Motschulsky, 1866, and the denials of Sharp[9] have not convinced me to the contrary. I have seen a cotype of *M. distinctum* (British Museum) and I may state that it belongs to *Pachysternum,* although the anterior tibiæ are straight on the outer apical margin, not at all sinuate, and only angular in the middle. Motschulsky, when he described *P. haemorrhoum* in 1866, did not state expressly, as Sharp claimed, that his beetle had the front tibiæ emarginate. Motschulsky had stated this three years before, in 1863, when making up the diagnosis of the genus *Pachysternum,* having then before him *P. nigrovittatum,* whose anterior tibiæ are indeed sinuate along the outer apical margin. Besides, the Russian entomologist was apparently not very well acquainted with the niceties of the French language, for he wrote "jambes anterieures echancrées * * *" when the word "sinuées" certainly would have been more in agreement with his observations. When in 1866 he met with *haemorrhoum,* this form in general habit seemed to him to belong also, as it does, to *Pachysternum* and he depended no longer on the tibial morphology. If we accept Motschulsky's description as exact, the only two points cited by Sharp as not agreeing with his *distinctum* are, the first of no great value and perhaps subject to individual variation ("pedibus piceis" according to the Russian author, clearer ferrugineous in Sharp's cotype), and the second inexactly quoted ("elytris * * * interstitiis basi *convexis*" according to Sharp, but Motschulsky wrote *subconvexis,* which is not quite the same). The base of elytral interstices, especially the outer ones, seen under favorable light are in *distinctum* more or less faintly subconvex, not entirely plane; this disposition agrees thus pretty well with Motschulsky's statement. *Pachysternum sibiricum* Kuwert, 1890, of which I received individuals correctly determined and sent to me by von Bodemeyer (Schilka Gora, Siberia Orient.) are very near *haemorrhoum* and, in fact, only differentiated, as stated by Kuwert,[10] by the femoral lines which are interrupted

[8] Deutsche Ent. Zeitschr. 22 (1878) 69.
[9] Ent. Mo. Mag. 15 (1879) 278; Trans. Ent. Soc. London (1884) 462.
[10] Verh. Naturf. Ver. Brünn 28 (1889) 171.

before attaining the hind coxæ near the middle of metasternum. I think that *sibiricus* is only a slight variation of the Japanese form.

This comparative study was necessary in connection with the preparing of the description of the following new Philippine species.

Pachysternum curvatum sp. nov.

Ovatum, valde convexum, nitidum, nigrum, vel obscure brunneum, postice dilutior, intervallis suturalibus omnino nigris; antennis basi, palpis pedibusque rufis; elytris profunde et anguste punctato-striatis, interstitiis subtilissime haud crebre punctulatis; tibiarum anticorum margine exterius regulariter curvatis, haud sinuatis, haud rectis; prostethii parte elevata in medio longitudinaliter carinata.

Type.—My cabinet, Luzon: Imugan (*Boettcher* leg.). Also a male cotype of same origin and another individual from Mount Banahao, with the above. Size 2.1 to 2.5 by 1.7 to 1.9 millimeters.

This species is very near to *haermorrhoum* and *sibiricum*, the comparison giving the following results: *curvatum* is of wider and shorter form, the ground punctuation of pronotum is finer, the coarser intermingled punctures therefore more distinct; elytra more shining and smoother, with the ground punctuation finer, the striæ, especially the internal ones, deeper and narrower, more clear-cut, with the inserted punctures much finer (in *haemorrhoum* and *sibiricum* these punctures are larger and the internal striæ are more like a series of punctures); mesostethial plate less rugosely punctured; metasternum with finer punctures; anterior tibiæ not so abruptly and strongly widened in the middle with outer margin regularly curved and with uninterrupted rows of marginal spines; in compared forms this margin has anteriorly, between middle and apex, two very obtuse angles, between which angles the margin is straight, not curved, and the marginal spines are wanting; it is by this character that these two forms were placed by their authors in *Pachysternum* (they seem to have overlooked that the punctuation of pronotum is composed of punctures of two sizes). *Pachysternum apicatum* has also a fine ground punctuation upon the pronotum, but the greater size of this Indian and Sumatran species and the widened anterior tibiæ, with outer margin partly straight, will immediately distinguish it.

Of wide, posteriorly much attenuate form, of a deep black color in the type, only ill-defined reddish on the anterior parts and middle of the head, on the lateral and anterior parts of pronotum and on the apex of elytra; yet the sutural interval remains black nearly to the extremity of the wing cases. In the two cotypes the dark parts are washed with very obscure brown.

Head densely punctured, the punctures of one size and not very fine, the interstices shining.

Pronotum with a background of very fine punctures, and with much coarser, remotely intermixed punctures, which become denser toward the sides, the posterior margin with a row of still coarser punctures on its edge.

Elytra very indistinctly, microscopically pubescent, with basic punctuation very fine, becoming gradually coarser toward the sides, with ten finely cut striæ which become weaker posteriorly and which bear toward the extremity diminishing striæ, and fine punctures which become coarser toward the sides; the tenth (outer) stria is much more deeply impressed than the others.

Mentum rugosely punctured. Prostethial plate rugose, bordered anteriorly and at the lateral sides, longitudinally carinated in the middle; mesostethial plate pentagonal, a little wider than long, rugosely punctate, with the ordinary posterior triangular excision; metasternum in the middle with not very coarse punctures, femoral lines not distinctly interrupted near posterior coxæ at middle of metasternum. Last ventral segment examined in the male cotype reddish, shining like the foregoing, with the exception of the first, which is rugosely and densely punctate and longitudinally carinate in the middle.

Male genital armature symmetric, with long embracing lateral lobes and tolerably broad median lobe which is shortly and triangularly pointed at the extremity.

HYDROPHILINÆ

Genus **PARACYMUS** Thomson, 1867

Entomological students have paid but little attention to these obscure little beetles and the descriptions are frequently insufficient and in many cases the ventral side has never been studied. The determination of the Philippine material has thus obliged me to reëxamine the species of the old world (Europe, Asia, Africa, Australia, and New Caledonia) with the material in my collection and, as far as possible, when none such were available,

the literature only. Of these forms *Paracymus rufipes* Guillebeau, 1896, from Syria, must certainly be removed from the genus having, according to description, all the femora densely pubescent. It must be a representive of *Anacaena*. *Paracymus metallescens* Fauvel, 1883, from New Caledonia is perhaps the same as *P. pygmaeus* W. S. MacLeay, 1871, from Australia, but no material from the original country could be seen; it may be added that Fauvel stated that his beetle occurred also on the Australian continent.

Most authors, with the exception of Fall, for *P. subcupreus* Say from North America,[11] seem to have overlooked that the male's fifth joint of anterior tarsi is sometimes provided with a very small tooth; the preceding joints of the same tarsi are also wider and shorter, more moniliform than in the female and in some species, *P. nitidiusculus* Brown (=*pygmaeus* W. S. MacLeay sec. Blackburn) for instance, the joints of first male tarsi are gradually, and especially the fourth and fifth, a little laminated toward the extremity of underside.

All the non-American forms are known to possess but 8-jointed antennæ; in the American species the number of these joints varies from seven to nine. I possess in my cabinet a specimen of *P. apicalis* Reitter from East Siberia (Sotka Gora) with 9-jointed antennæ. This important character was not seen by Reitter. Finally, the species inhabiting the Oriental Region and Australia known to me all have a longitudinal carina in the middle of first ventral segment. This is perhaps the reason why W. S. MacLeay described *pygmaeus* as a *Cyclonotum*, although it is not at all certain that the character alluded to was observed by him. A ventral carina is very rare in the Hydrophilinæ and occurs on the contrary very frequently in the Sphaeridiinæ.

Summing up all these differentiations we may be able now to take the first step toward the classification of these difficult forms. The following key comprises only such known forms as I have been able to study in nature, according to correctly named material.

Key to known species of Paracymus Thomson.

1. Antennæ 9-jointed. Prostethium very long before the anterior coxæ, not carinate at all. First ventral segment without carina in the middle. Intermediate femora with basal pubescence reaching beyond the middle. Mesostethium nearly unarmed, with only a slight tuber-

[11] Fall, Occasional papers, Calif. Acad. Sci. 8 (1902) 218. No tooth is present in the male of the Bolivian *P. attenuatus* and *obliquus* d'Orchymont.

culiform elevation before the intermediate coxæ, and without transversal ∧ crest. Posterior margin of pronotum very distinctly bisinuate. (Siberia.) ..... P. apicalis Reitter.

Antennæ 8-jointed. Prostethium more or less longitudinally tectiform or carinate along the middle ..... 2.

2. First ventral segment not carinate in the middle ..... 3.

First ventral segment longitudinally carinate. (India, Seychelles, Australia.) ..... P. evanescens Sharp.
P. alluaudianus H. Scott.
P. pygmaeus W. S. MacLeay.

3. Intermediate femora with basal pubescence reaching beyond the middle of femora. Tibiæ of obscure color ..... 4.

Intermediate femora with basal pubescence not reaching beyond the middle. (Europe, Siberia, Caucasus.) ..... P. aeneus Germar.
P. relaxus Rey.
P. schneideri Kuwert.

4. Mesostethium with a fine longitudinal carina posterior to the transverse ∧ crest. (Asia Minor, Transcaucasia.) .... P. caucasicus Kuwert.

Mesostethium without conspicuous longitudinal carina or with a very small one, but then the punctures of elytra are very fine and geminate under high power ..... 5.

5. Elytra with normal punctures of a tolerable strength. (Europe.)
P. scutellaris Rosenhauer.

Elytra with much finer and remoter punctures; seen under a high power these punctures seem to be double, like a minute figure 8, as though two punctures were coalescing, or resembling umbilicated punctures, also of much smaller size. (Mediterranean, France.)
P. punctillatus Rey.

Other species still unknown or insufficiently known to me are: *P. chalceolus* Solsky, 1874, from Turkestan; *chalceus, liliputanus,* and *minor* Régimbart, 1903, from Madagascar; *nigerrimus* Blackburn, 1891, from Australia. I possess a *Paracymus* from Guinea determined as *cybocephaloides* Reitter in litt., which name, according to Knisch,[12] should apply to the *P. minor* of Régimbart. However, in my specimen the pubescence of the intermediate femora does not reach beyond the middle, as it does in the Madagascan species, the type of which has been examined by H. Scott.[13]

Paracymus evanescens Sharp, 1890.

Two specimens, one from Montalban, the other from Manila (*E. Simon*), seem to belong to this species. They have the same small size (scarcely 1.5 millimeters) and the same kind of dorsal punctuation, the upper side being of a deep black and not brassy;

[12] Archiv. f. Naturgesch. (1919) 67.
[13] Trans. Linn. Soc. London XVI 2 (1913) 202.

they show but few points of variation as compared with a cotype from Kandy. This cotype is probably the same seen by H. Scott, for Sharp had only two specimens at his disposition; but I must confess that I have not been able to see clearly the gemination or umbilication of the punctuations of elytra as described by H. Scott (which appeared to him as a small figure 8). With a good microscope of high resolving power and without artificial light the punctuation appears simple; only with artificial light the punctuations appear here and there to be geminate, but at any rate far from distinctly so, as is the case in *punctillatus* Rey where the punctuations (65 diameters; binocular Zeiss) are very much finer and appear clearly as if two punctures were coalescent. I think that this appearance is to some extent only an optical illusion. I have also seen a specimen from Adelaide River and another from Port Darwin (Australia, British Museum) of the usual small size, which belong also, I think, to this species.

I have studied a far more numerous series from Manila (*Baer, Boettcher,* leg.) and one from Los Baños (*Baker*) which may be treated as a variety of *evanescens*. By their greater size (1.8 to 2 millimeters), their coarser dorsal punctuation, their more obscure dorsal color, only faintly fuscous at apex of elytra and at the anterior angles of pronotum, they approach *pygmaeus* MacLeay from Australia. The punctuation on the sides of elytra is also more distinctly geminate than in *evanescens;* they may represent a geographical race of the latter and I have named them *orientalis* var. nov.

It is impossible not to feel some doubt as to the specific validity of such difficult forms as *evanescens, pygmaeus,* etc., and I have hitherto failed to detect good discriminating characters.

Paracymus punctillatus atomus var. nov.

This form is of smaller size (1.1 to 1.2 millimeters), black, not brassy or metallic, upper side with punctuation, especially of elytra, far less distinct, finer, otherwise very similar; antennæ 8-jointed, first abdominal segment not carinate, intermediate femora with pubescence reaching beyond the middle, mesostethium between middle coxæ with a very fine, indistinct, longitudinal carina beyond the transversal /\ crest, elytra with microscopically geminated punctures.

Montalban, two specimens (*Boettcher* leg.). I have seen this form also from Singapore (*Saunders*), Madagascar, Tananarive, East Africa, and Belgian Congo (Banana-Boma,

Tschoffen). It seems thus very widely distributed. I have treated it as a mere variety of Rey's species for I am acquainted with only a single specimen of *punctillatus* Rey from Nizza, the typical locality, and am not well informed as to its variation. Régimbart recorded the species as abundant in East Africa, but his statement may perhaps refer to the present variety. According to Rey and Ganglbauer the type species is, like my specimen, of greater size (1.6 to 2.2 millimeters) and of brassy color.

Helochares (Hydrobaticus) anchoralis Sharp, 1890.

A good series from Manila (*Boettcher* leg.) and also three specimens from Los Baños (*Baker*).

Helochares (Hydrobaticus) crenatus Régimbart, 1903.

Seems also abundant in its haunts; Luzon, Los Baños, Paete, Balbalan, Montalban (*Boettcher* leg.).

Helochares (Chasmogenus) livornicus Kuwert, 1890.

abnormalis SHARP, 1890.
mollis RÉGIMBART, 1903.
? ferrugatus RÉGIMBART, 1903.
abnormicollis ZAITZER, 1908.

I refer to this species one specimen from Mount Maquiling, Luzon (*Baker*); another from Manila and a third from Mount Banahao, also in Luzon (*Boettcher* leg.), of very obscure tinge.

Helochares (s. str.) taprobanicus Sharp, 1890.

atropiceus RÉGIMBART, 1903.

One specimen captured by Baker on Mount Maquiling in Luzon and another at Sandakan, Borneo.

Helochares (s. str.) pallens W. S. MacLeay, 1825.

minutissimus KUWERT, 1890; RÉGIMBART, 1903.

Enhydrus pallens MacLeay is cited under *Enochrus* (*Lumetus*) in the catalogues; I do not know why. Two frequently very pallid Hydrobiini of the size indicated by the old author (3/32 = 2 millimeters 4/10) are very common in the Oriental Region and represented in nearly all the invoices received from the East Indies; namely, *Enochrus escuriens* Walker and *Helochares minutissimus* (Kuwert) Régimbart. The former has the head of a deep black color which is not in accordance with MacLeay's statement: "E. albicans * * *" . The very short original description terminates as follows: "thorace maculis quatuor obscuris transverse dispositis elytrisque obsolete striatis." By the last

three words are intended in my opinion the infuscated longitudinal lines which correspond to the longitudinal rows of punctures of underside of elytra and are seen by transmitted light. I have not seen Arabian or Syrian specimens and so cannot state if Régimbart was correct in his identifications. I have already expressed doubt as to this.

Helochares (s. str.) **pallens insolitus** var. nov.

Among the *Helochares* sent by Staudinger there is a troublesome specimen from Manila which differs only from the very common, always pallid *pallens* by the dark blackish color of upper and underside, the black palpi and legs, and by the dorsal sculpture of elytra and thorax being visibly coarser. I am not able to find other differences; the fifth abdominal segment is also emarginate-ciliate at the apex and the mentum and submentum are coarsely sculptured as in *pallens*. The individual is in a decayed state, having lost all its tibiæ and tarsi; it looks as if it belonged to a different species but the material is insufficient to decide now. So, the specimen being in the meantime worthy a name, I leave it as a variety of *pallens*.

Pelthydrus minutus d'Orchymont, 1919.

This very minute and good species was described from a single specimen from Palembang, Sumatra. I have received since from Staudinger four other examples captured at Montalban, Philippine Islands. One of these and also the type have the maxillary palpi a trifle shorter, in the other specimens especially the second joint when seen from above. Possibly this may be a sexual character, but I have not been able to settle the matter, for, on account of paucity of material, I did not dare to risk dissection.

Enochrus (s. str.) **fallax** sp. nov.

Late ovalis sat convexus, nitidus, ferrugineus, capite in medio anguste longitudinaliterque, prothorace sat late in disco, elytris fere toto, infuscatis; antennis basi, palpis testaceis, pedibus ferrugineis; prothorace, praesertim capite subtiliter, crebreque punctatis, elytris etiam subtiliter punctatis, his duobus seriebus internis systematicis (secundariis) irregulariter bene distinctis, seriebus primitiis maxime subtilius, in intervallo plus minusve distinctis, segmento abdominali quinto postice in medio perminute emarginato et ciliato.

Type.—My cabinet, Montalban (*Boettcher* leg.), one specimen, 2.6 by 1.6 millimeters.

Of a ferrugineous color indefinitely infuscated in the middle of prefrons narrowly, on the postfrons wholly, on median third of pronotum nearly, and on elytra with exception of the sides, a wide space becoming gradually wider behind near the suture; in this ferrugineous band posteriorly are transparent black punctures of the primary series. The shape of the beetle is widely oblong with the sides nearly parallel and the apex of elytra broadly rounded.

Head with the transversal and sagittal sutures present as fine impressed lines, on the inner side of the eyes are present a few very irregular larger punctures, the largest of which are near or upon the transversal suture; the punctuation of the upper surface of head is very fine, almost microscopical. The labrum is very short and broad with punctures of nearly the same size; the eyes are not at all prominent; maxillary palpi with second joint nearly straight, the third joint much shorter, the fourth about of same length as the third and bent outward as usual; antennæ short with the club infuscate, nearly as long as joints 2 to 6 taken together, the last joint as long as the two preceding pubescent joints of club taken together.

Punctuation of pronotum as fine as on the head, perhaps a trifle coarser; pronotum finely bordered on the sides, this border being continued very finely on the anterior but not on the posterior margin; anterior and posterior angles rounded, the former distinctly more so than the latter; the two lateral regular rows of punctures are discernible but the punctures are not so large as on the head.

Base of elytra as wide as posterior margin of pronotum, elytra bordered on the sides very narrowly especially posteriorly toward the suture, sculpture a trifle less microscopical with the two inner rows of punctures very irregular, but well marked; round these one can see the very small and fine punctures of the very regular primary series, two on their interval, one near the suture, and several others laterally. Near the lateral margin the punctures become indistinct and more or less intermingled with those of the not very conspicuous outer (third) row, the punctures becoming here a little coarser. Sutural stria well impressed, ascending to the scutellum at a distance only a trifle greater than its own length.

Mentum a pentagon nearly as long as wide, finely sculptured or dull on its anterior two-thirds, broadly but very shallowly impressed there, more shining behind. Prostethium pointed before, tectiform but not carinate in the middle; mesostethium

with a not very high nor very acute carina before the middle coxæ, declivous anteriorly; metasternum depressed on both sides to allow movement of hind femora. Ventral segments, fore and middle femora with exception of knees, coated with hydrofugal pubescence, the hind femora with only scattered setæ and only with some pubescence on the inner foreside. Femora and tibiæ robust for the small size of the insect, the tarsi slender and very much shorter than their corresponding tibiæ.

This new species is of the size of *E. peregrinus* Knisch from New South Wales, but the latter form is darker and is said to have no regular rows of punctures on elytra.

Enochrus (Lumetus) escuriens Walker, 1858.

nigriceps MOTSCHULSKY, 1859.

Cited already from the Philippine Islands by Régimbart and by Schultze. Specimens were seen from Luzon, Manila, and Antipolo. Very common species in the Oriental Region.

Enochrus (Lumetus) malabarensis Régimbart, 1903.

LUZON, Manila, Lanao, Mount Banahao (*Boettcher* leg.).

I have carefully compared the specimen with a typical specimen of *malabarensis* (from Calicut, India) in my cabinet and cannot point out any differences.

Enochrus (Lumetus) fragiloides sp. nov.

Sat late ovalis, sat depressus, politus, obsolete punctatus, testaceus, vertice et elytrorum intervallo interno postice ad suturam nigricantibus, labro haud nigricante, subtus plus minusve infuscatus, segmento abdominali quinto postice in medio emarginato et ciliato.

Type.—My cabinet, Luzon, Los Baños (*Boettcher* leg.), 3 by 1.6 millimeters. Several cotypes from the same locality sent by the same, and also one from Manila. Size varying from 3 to 3.3 millimeters.

Comes very near to *fragilus* Sharp of Ceylon, of which I have seen a cotype, and to *icterus* Knisch from W. Almora (India). From the first it is distinguished by its broader and shorter shape, the convexity being less, and its smaller size; from the latter it may be roughly separated, according to description, by the entirely pallid labrum, the ordinary infuscated sutural interval in its posterior part, the systematic punctures of elytra being not strongly developed, the anterior dentation of mesostethium being not directed backward.

Head more or less transverse, of a reddish yellow, infuscated behind the transversal suture and also more or less triangularly in the middle of prefrons behind against this suture. Punctuation very fine, regular punctures on the same suture and behind this on each side against the eyes distinctly coarser. Anterior margin of prefrons with slight and shallow emargination in the middle behind labrum; this behind with punctures a trifle denser and coarser than the basic punctures of prefrons and arranged in a somewhat transversal manner. Palpi entirely yellow.

Basic punctures of pronotum of nearly the same size and spacing as on the head; pronotum at base nearly twice as broad as long in the middle. Anterior angles very much rounded, the posterior less so, the delicate lateral border being continued very obscurely along the anterior margin. Regular rows discernible but composed of very fine punctures scarcely twice as large as the basic punctuation.

Scutellum and elytra as indistinctly punctured as pronotum with the regular rows composed of faint punctures; only the sutural interspace is ordinarily infuscated behind and sometimes there is also a black mark on the shoulders.

Mentum shining, with some scattered, not very coarse punctures. Prostethium obscurely tectiform in the middle. Mesostethium with a vertical lamina not very highly developed and in front with a little tooth directed toward the surface. Metasternum on each side obliquely depressed to allow movement of hind femora; the latter are not very broad and all are densely coated with hydrofugal pubescence, the knees excepted. Tibiæ and tarsi of a red-brown color, the former not very broad, the latter rather slender.

Enochrus (Lumetus) rubrocinctus Régimbart, 1903.

bakeri A. D'ORCHYMONT, in coll.

LUZON, Burauen, Manila, Mount Maquiling. LEYTE. BURU ISLAND in the Malayan Archipelago. Calcutta, Berhampore (Bengal). The punctuation of pronotum is highly variable but I am convinced now, though I have not seen typical examples, that it is the species of Régimbart described from Indo-China, India, and Sumatra.

Chaetarthria indica d'Orchymont, 1920.

Several specimens of this species were obtained from Montalban and sent by Staudinger. I cannot separate these speci-

mens from the Indian ones. Besides, I think that *C. almorana* Knisch, 1924,[14] is merely a synonym of this form. The two descriptions agree well as I have described the punctures on outer side of elytra as "mal indiques" the one or two series so formed being very inconspicuous and short, although under a high power and favorable light they seem more or less regular. But this is subject to variation as is also the color of legs. In the Indian specimens the femora and tibiæ are of an obscure reddish brown, with the tarsi more diluted; but practically the upper surface of elytra is, as stated by the Austrian author, "glatt, sehr stark glänzend, sculpturlos." The size also is subject to variation. Another country for this species is Tonkin (*Dr. Santschi* leg.).

Sternolophus (Neosternolophus) brachyacanthus Régimbart, 1902.

LUZON: Manila, Lamao (*Boettcher* leg.), two specimens Already cited from the Philippines by me in 1919.

Sternolophus (Neosternolophus) tenebricosus (Blackburn), d'Orchymont, 1911.

LUZON: Paete (*Boettcher* leg.), two specimens.

Sternolophus (s. str.) rufipes Fabricius, 1792.

This species is already known from the Philippines through Baer and Atkinson.

LUZON, Los Baños (*Baker*), Zambales, Kavignian (*Boettcher* leg.). Very common throughout the Oriental Region.

Neohydrophilus spinicollis elongatus Régimbart, 1902.

One male and one female from the Philippine Islands sent for examination by the British Museum and one specimen captured by Baer (*Peschet* coll.). Régimbart has already cited *spinicollis* from these islands.

Hydrous (s. str.) picicornis Chevrolat, 1863.

Cited already by Baer, Atkinson, Kuwert, Régimbart, and Schultze.

LUZON, Zambales, Manila (*Boettcher* leg.); also Los Baños (*Baker*).

Amphiops mirabilis Sharp, 1890.

One specimen secured by E. Simon at Manila. This species is known from Ceylon, India, Indo-China, Sumatra.

[14] Wien. Ent. Zeit. 41 (1924) 39.

Amphiops ? sumatrensis Régimbart, 1903.

A single specimen labeled Manila (*E. Simon*) which seems to belong here. In several cases these difficult beetles do not seem capable of certain determination and a thorough revision of the genus is needed.

Berosus (s. str.) **pulchellus** W. S. MacLeay, 1825.

pubescens MULSANT, 1859.
decrescens WALKER, 1859.

Already known from the Baer, Atkinson, Régimbart, and Schultze writings.

I have seen specimens from Manila and Kavignian, Luzon.

Berosus (s. str.) **affinis** Brullé, 1835.

One specimen labeled "Philippines" in the Deutsches Entomologisches Museum, Berlin. Seems very doubtful. Imported?

Berosus (Enoplurus) indicus Motschulsky, 1861.

Cited by Régimbart, and by Schultze after him.

Specimens were studied from Luzon: Los Baños (*Baker*), Manila, and Kavignian.

Berosus (Enoplurus) fairmairei (Zaitzer) d'Orchymont, 1913.

LUZON, Laguna, Los Baños (*Baker*). Surigao and Manila (*Boettcher*). Also at Mindanao. Others were also captured at the last-named locality by Baer and Simon.

Régimbartia attenuata Fabricius, 1801.

aenea BRULLE, 1835.

Already known from the Philippines, according to Régimbart and Schultze.

Several specimens were received from Luzon: Manila and Kavignian.

The above complete list comprises forty-nine forms. Ten of these are new to science and eight of them peculiar to the Philippine Islands. Twenty-five genera or subgenera are represented, of which one (*Coelofletium*) was hitherto unknown. I am convinced, as already stated, that this is only a small part of the existing Hydrophilidæ of these islands.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, IX

KORREKTUREN

Von HANS GEBIEN
Hamburg, Deutschland

Die oben genannte Arbeit ist schon im Dezember 1920 abgeschlossen gewesen und nach Manila gesandt, aber erst 1925 erschienen. In der Zwischenzeit sind einige Arbeiten über Tenebrioniden veröffentlicht, deren Resultate natürlich nicht berücksichtigt werden konnten. Im Laufe dieser Zeit ist mir auch sehr viel Material, besonders von den Philippinen, in die Hände gelangt. Dass dieses, obgleich ich es den Sammlern bestimmt habe, in der Arbeit fehlt, ist aus dem obengenannten Grunde zu erklären. Leider habe ich vor der Drucklegung nicht Korrektur lesen können. Es sind daher zahlreiche, sehr störende Druckfehler stehen geblieben, die man nicht mir zur Last legen möge. Von einer Berichtigung dieser Fehler, habe ich hier Abstand genommen.

PHILIPPINE JOURNAL OF SCIENCE, VOLUME 26, 1925

Seite 68, Zeile 11, zum Beispiel ist auszulassen.
Seite 68, Zeile 40, *statt* auch ihm *lies* auch ihnen.
Seite 72, Zeile 45, *statt* Helom.-Arten *lies* Helops-Arten.
Seite 76, Zeile 21, *statt* Aber diese Merkmale *lies* Diese Merkmale.
Seite 79, Zeile 12, statt *Opatium*-ähnlich lies *Opatrum*-ähnlich.
Seite 423, Zeile 21, *statt* ungehäutet ist *lies* ungekantet ist.
Seite 438, Zeile 24, statt *Bolitoplegus vacca* lies *Bolitophagus vacca.*
Seite 537, letzte Zeile, *statt* erscheinen an anderer Stelle *lies* sind an anderer Stelle erschienen.
Seite 538, Zeile 6, *statt* flachen, weitläufigen Körnchen *lies* flacher, weitläufiger Körnchen.
Seite 538, Zeile 45, *statt* B. celebensis sp. nov. *lies* celebensis nom. nov.
Seite 543, Zeile 8, *statt* schlanke Tiere *lies* schlanke Formen.
Seite 546, Zeile 9, *statt* B. celebensis sp. nov. *lies* celebensis nom. nov.
Seite 548, Zeile 17, statt *Opatrium serricolle* lies *Opatrum serricolle.*
Seite 565, Zeile 3, Mit dem Wort Ausser muss ein neuer Absatz beginnen.
Seite 566, Zeile 15, *statt* anicorum *lies* amicorum
Seite 567, Zeile 24, *statt* pici Chatin *lies* pici Chatanay

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Seite 131, Zeile 26, statt *Glyxerus* lies *Ilyxerus*
Seite 131, Zeile 31, *statt* Solander *lies* Solier
Seite 132, Zeile 26, *statt* Solander *lies* Solier
Seite 132, Zeile 35, *statt* fest auf der Stirn *lies* fast auf der Stirn
Seite 133, Zeile 23, 26, 27, statt *elongatus* Redtenbach lies *elongatus* Redtenbacher
Seite 133, Zeile 31, *statt* Das Weibchen unterscheidet sich vom Männchen *lies* das Männchen unterscheidet sich vom Weibchen.
Seite 134, Zeile 2, statt *Dysantes biluna* lies *Toxicum biluna*.
Seite 135, Zeile 22, *statt* Halopiden *lies* Helopiden
Seite 137, Zeile 36, statt *Parta* lies *Païta*
Seite 140, Zeile 20, statt *Platydema* lies *Platydemen*
Seite 141, Zeile 26, statt *Platydema* lies *Platydemen*
Seite 144, Zeile 20, *statt* B. hellus *lies* B. helluo
Seite 146, Zeile 24, *statt* Pelobo cas *lies* Pelobocas
Seite 147, Zeile 35, *statt* Basanus sumatranus *lies* Basanus sumatrensis
Seite 152, Zeile 10, *statt* Basanus hellus *lies* Basanus helluo
Seite 154, Zeile 24, statt *B. hellus*, lies *B. helluo*
Seite 264, Zeile 13, *statt* etwas anderes *lies* nicht anderes
Seite 274, Zeile 26, *statt* einschlüssige Litteratur *lies* einschlägige Litteratur
Seite 276, Zeile 25, *statt* Graveley *lies* Gravely
Seite 288, Zeile 6 und 7, *statt* Ceropria yris *lies* Ceropria iris
Seite 423, Zeile 18, *statt* wie alle Diaperiden *lies* wie fast alle Diaperinen
Seite 433, Zeile 1, *statt* deren gänzliches Fehlen *lies* derem gänzlichen Fehlen
Seite 435, Zeile 4, *statt* beim Männchen nur *lies* beim Weibchen nur
Seite 542, Zeile 33, *statt* schärg erweitert *lies* schräg erweitert
Seite 542, Zeile 38, *statt* das linke Horn *lies* das rechte Horn
Seite 545, Zeile 31, *statt* halbgerandet *lies* hellgerandet
Seite 560, Zeile 30, *statt* ungebrochenes Gabelhorn *lies* umgebrochenes
Seite 564, Zeile 17, *statt* Beim Männchen *lies* beim Weibchen
Seite 565, Zeile 7, *statt* Burma, Peger *lies* Burma, Pegu
Seite 583, Zeile 32, statt *P. malaccum* lies *P. detersum*
Seite 583, nach Zeile 39, schalte ein *Ceropria valga* Pascoe, Ann. & Mag, Nat. Hist. IV 3 (1869) 281.
Seite 586, Zeile 8 bis 28 (zweiter und dritter Absatz) gehören ans Ende von Seite 585.
Seite 586, Zeile 28, statt *Ceropria salga* lies *Ceropria valga*
Seite 590, Zeile 39, *statt* und der den Flügeldecken ausschliessende *lies* und der sich den Flügeldecken anschliessende
Seite 592, Zeile 40 und 41, *statt* Basides crassicornus *lies* Basides crassicornis

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Seite 115, Zeile 37, *statt* weil aber die meisten *lies* weil eben die meisten
Seite 116, Fussnote *lies* Lesne, Bull. Soc. Ent. Fr. (1915) 189.